

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY BY THE RAILROAD GAZETTE AT 83 FULTON STREET, NEW YORK
BRANCH OFFICES AT 375 OLD COLONY BUILDING, CHICAGO, AND QUEEN ANNE'S CHAMBERS, WESTMINSTER, LONDON

EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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VOL. XLIII., No. 14.

FRIDAY, OCTOBER 4, 1907.

The huge figures for the freight and passenger movement in the United States, and its enormous growth within a short period, during which the increase in mileage has been comparatively small, tends to create the impression that there is generally great density of traffic, which impression is strengthened by the obvious fact that many important lines have had at times more traffic than they could handle. Taking the railroad system as a whole, however, the traffic must still be called thin. The movement on the 222,340 miles reported for 1906, if evenly distributed in time and over the railroads, was equivalent to a daily movement in each direction of 181 passengers and 1,330 tons of freight, say one train a day each way with three full carloads of passengers and another with 33 full carloads of freight. Seeing as we do on the more important lines train after train pass much larger than these (though rarely fully loaded in both directions) it is hard to believe this; but by as much as the traffic vastly exceeds this on certain lines, by so much it falls below it on others; and rates which leaving a narrow margin of profit where the traffic is dense, yet yield an abundant return, are not likely to pay the working expenses where it is light. But the average density of traffic is still much greater than formerly. There is nearly twice as much passenger traffic per mile of railroad as in 1897, and quite twice as much freight traffic as in 1895. From 1870 to 1885 the very large increase in mileage frequently reduced the average traffic per mile. Main lines had few interruptions in their growth; but thousands of miles of new lines on the frontier and of branches in undeveloped country often more than counterbalanced this. Now, it is practically impossible to add 10 per cent. to the mileage in a single year, as was often the case formerly, and it is many years since the addition has been as much as 3 per cent.

The New York, New Haven & Hartford Railroad Company's property reaches four states in which it encounters varying statutes of taxation. The appearance recently of its president before a special committee of the Massachusetts legislature as an advocate of direct taxation of the corporation instead of the personal taxation of the stockholder or bondholder is significant, if for no other reason, because it is based on a wide range of experience. The forms of railroad taxation in the country are still infinite. But there appears to be a slow but steady drift toward the New Haven President's suggestion of taxation directly levied by the state on railroad debt at or about par value and on capital stock at nearly market value—usually in practice a little below that value on the theory that any large amount of the stock, if put on sale, would depress the

market price. This sweeping dictum of direct taxation by the state based, in the case of interstate systems, on mileage within the state, has the manifest advantage of simplicity and of reaching every holder of stocks and bonds. Its disadvantage is the minor one of taxing a varying market value of the stock and, for example, letting a railroad now and then carry over a new issue of bonds or of stock just beyond the assessment period and thus escape for a year. If the plan, which a number of states adopt, of redistributing tax receipts among the towns, cities or counties through which the railroad runs is also adopted, the equities of the tax adjustment seem pretty complete. In this big, waxing and complicated question of railroad taxation one broad movement may also be noted: When the railroad lines were short, local and isolated the theory of local taxation was naturally dominant. As the lines have consolidated into longer lines and these into systems state taxation has come to the front, the state sometimes collecting for itself, sometimes acting merely as a tax collector for the municipalities and lately, in the case of New Jersey "splitting" the question by taxing "main stems" for state revenue while other railroad property pays local taxes. But the whole system of American railroad taxation is shot through with inequities. Why, for instance, should the resident of Connecticut be taxed on outside railroad bonds but go free on outside railroad stocks without regard to the outside and local taxation which either may bear? Ere long, also, the street railways are going to load the general problem with new enigmas. Just now the street railways may be regarded as fittest subjects of municipal rather than state taxation. Generally speaking their higher valuations are localized to centers of dense population, and the municipality which has yielded franchise rights in its streets has the primary claim to revenue from taxes. But the situation is sure to be modified as the local systems merge, extend into long distance, cross country and interstate systems, are taken up by the steam companies and ultimately—as in the case already of the New Haven—consolidated with them. State equities as against local equities in such a hybrid status of the blended lines will give us some fresh tax problems sure to be puzzling and often polemical.

The ten-wheel locomotive for the Great Western Railway, illustrated elsewhere in this issue, has a number of features that should at least attract the interested attention of American railroad men. Some of them suggest a possible simplification of our own practice, while others go to the opposite extreme and suggest complications that no superintendent of motive power in the United States would

care to advocate. Chief among these is the use of four simple cylinders instead of two. If these four cylinders were of exceptional size and the engine of great weight the reason for their existence would be readily understood. But why four cylinders of 14¼-in. diameter instead of two of the equivalent diameter of 20½-in.? The one advantage that they possess is that the reciprocating parts are in perfect balance and are light; but it would hardly seem that this advantage could outweigh the disadvantages of the duplication of every working part, the trouble from the inaccessibility of the machinery between the frames, the crank axle and all the accompaniments. A glance at the illustrations will show that inspection of the inside working parts is quite out of the question except from a pit, and it must be remembered that this includes the whole of the valve motion except the end of the rocker and the stem of the outside valves.

The valve motion is designed along lines that are worthy of examination. There are no eccentrics or return cranks, and this may mean a possible simplification. Whether the cross connection from one set of cylinders to the other can be made more cheaply and cost less for maintenance than the usual construction with the Walschaert gear, remains to be seen. Certainly nothing can be much more simple than the return crank, and we hear of very little trouble caused by it; but that is no reason why we should not look into this Great Western scheme.

The care with which the details are worked out will undoubtedly insure the success of the engine mechanically, and under the conditions of English practice, possibly economically also; though if it were to be subjected to the ordinary treatment of locomotives on American roads it would probably not have either of these results to its credit. It stands, however, as a strong exemplification of the position of the English chief of motive power, as compared with his American brother, in that he can design and build such a machine as this without a question, because he is the responsible party and is the dictator as to what shall be built and used; a course of action that would be quite impossible in the United States.

THE EFFICIENT ILLUMINATION OF PASSENGER CARS.

Illuminating engineering is one of the newest of the professions. It is so new, in fact, that the significance of the term is not generally understood as yet. It has been defined as "the efficient use of artificial light"; that is, obtaining the best illuminating effects with the least waste of light. Comparatively few persons understand and appreciate the importance of this, and that the proper placing, reflecting and shading of artificial lights is an art requiring the expert knowledge of a specialist. As a result, most of the artificial lighting of to-day is a succession of examples of "how not to do it."

This lack of understanding and appreciation of the correct principles of artificial lighting is as manifest in passenger train lighting as elsewhere. For while the problem of efficient lighting of cars contains limitations not found in other places, the fact remains that the methods generally in vogue were evolved with little or no thought of the visual comfort of the passenger. For example, it is a fundamental rule that brilliant radiants should be kept out of the field of vision, or else that their intrinsic brilliancy be greatly reduced, as exposed lights, of any but low intensities, strain the eyes; yet ignorance of this rule is responsible for one of the commonest faults of unscientific artificial lighting. A line of brilliant unshaded lights along the ceiling of a car, as is the general custom, tries severely the eyes of all passengers having to face them. No one who has spent any time on a passenger train after dark needs to be told this. Since it is impracticable to place these lamps outside the field of vision, they should be so shaded as to reduce their intensity to a comfortable degree. The popular belief that the more light there is the better one can see is fallacious. There is a limit to the amount of light the retina of the eye can endure with comfort, and more than this produces strain, making it harder to see well than with less light.

The secret of correct illumination lies in properly directing or diffusing the light. For general lighting of cars, where hiding the lights is impracticable, as with gas lamps for instance, opal or, preferably, holophane globes should be used to keep down the intrinsic brilliancy. As a matter of fact, the general practice for illumination of cars is very wasteful of light. Much better results could be obtained at a less cost by actually reducing the quantity of the light and delivering it where it is needed by the use of suitable reflectors.

Electric lighting offers the illuminating engineer the best opportunities for the exercise of his art, of course, the incandescent lamp being the best adapted of any for getting just the results desired. But since this is the most expensive form of car lighting, general practice will continue the use of other kinds for some time to come. Therefore, since present conditions of illumination with these lights are susceptible of considerable improvement, efforts might profitably be directed to the application of methods to get better results from them and thereby not only save money by actually diminishing the amount of light now considered necessary for adequate illumination, but at the same time enhance materially the comfort of the passengers. However, it was stated at the September meeting of the Western Railway Club that by the use of proper methods in reflecting and diffusing the light the effective illumination of cars could be secured at a reduction of about one-third in the amount of electric power now generally used. This being correct, it means apparatus of less capacity, and therefore of less cost, to furnish the power, and lower cost of operation and maintenance. Since the expense is the one barrier to the general use of electricity for car lighting, a means for lessening this obstacle appears to be at hand. But aside from the important desideratum of cost, it seems not improbable that the time is approaching when the scientific illumination of passenger cars will be considered fully as important as their comfortable heating, and almost as necessary as a proper system of ventilation.

THE HARRIMAN REFRIGERATOR CARS.

Beginning October first, the refrigerator traffic on the Harriman lines, including the extremely heavy transcontinental fruit traffic, is being carried entirely in the companies' own cars, 5,000 of which have already been delivered to the Southern Pacific, with 1,600 more to come, the total cost of the equipment being approximately eleven millions. This is the most interesting immediate outcome of the action of Congress in making private car lines common carriers. The Armours formerly supplied the Harriman lines. It was brought out in testimony that the Armour interests owned some 14,000 refrigerator cars, and rented them on a mileage basis of three-quarter cents per mile, going and coming, with a further agreement, in the case of the Southern Pacific, that the Armour Car Line Company should furnish 5,000 cars, or such number as might be necessary to secure to the fruit shipping interests of California a sufficient number of combined ventilator and refrigerator cars for the transportation of fresh fruit and vegetables from California to the eastern states, in return for which the Armour Car Line was given the exclusive privilege of furnishing the refrigerator equipment, so long as it complied with these conditions. Because of the disparity between the volume of deciduous fruit shipments during the summer months and that of the citrus fruits during the winter months, the Southern Pacific Company had believed it would be unwise to provide cars of its own, since these cars would presumably lie idle for a good part of the year. In the Armour organization, the seasons in different parts of the country were utilized to strike a balance, and cars not needed in the California trade could be sent temporarily to Michigan, Texas, Georgia or elsewhere, as the need might be. But the Harriman lines have now bought a third more cars than the entire number formerly furnished them by the Armours, at a cost more than double that which was testified to in 1905 as prohibitive, and it will be a traffic question of great interest to note how the experiment works out, and whether work for the cars can be found, all the year around, in Harriman territory. If not, refrigeration charges must either provide for the dull season, or the cars must be sent out in competition with the Armour cars, and subject to difficulty in dealing with any kind of exclusive contracts to which one-season fruit roads, like the Pere Marquette, may have been able to bind themselves under the new law.

But it may be assumed that these difficulties will not prove very serious. According to the 1905 testimony, the total number of refrigerator cars in the country at that time was about fifty thousand, and the demand had grown to exceed the supply. In view of the tremendous growth of the California fruit industry, it may be hazarded that the present supply of cars will not exceed the present demand, and that mutually satisfactory adjustments can be made. Shipments of California oranges, lemons and grapefruit for the season now closing aggregate nearly 30,000 carloads. Deciduous fruit shipments have also made a high record for the season. Moreover development of an all-the-year-round orange crop

to meet the constant demand for this fruit has been carried out so successfully that now there is hardly a day in the year in which orange shipments are not made. On account of the increased acreage coming into bearing, it is estimated that the citrus fruit shipments from California during the season beginning Nov. 1 will reach 35,000 cars. Pre-cooling before fruit is loaded into cars is being resorted to on a greater scale than ever before, with the result that a considerable quantity of fruit and melons that are now spoiled in transit will reach the eastern market in good condition. The Southern Pacific is erecting three ice manufacturing plants for its new refrigerator car service, to avoid the possibility of an ice shortage such as has happened in past years, causing loss to the fruit shippers.

The refrigerator car business on the Harriman lines will be carried on by the Pacific Fruit Express Company, a company controlled by the Union Pacific, and specially organized to take over the traffic formerly handled by the private refrigerator lines. Some doubt had existed on the right of the Union Pacific to own stock in a refrigerator line, but all uncertainty on this point was cleared up at the last session of the Utah legislature. At that session a new railroad law was passed codifying the railroad laws of the state and including in the privileges accorded to the railroads organized under the laws of that state the right to own express and refrigerator lines.

Mr. Harriman has been quoted to the effect that the lines in his system would hereafter be able to give an enlarged and better service and that earnings would undoubtedly be increased from that source. "Whatever they (the Armour's) made, we will make," he said, but he left unsettled the question whether this was to apply to profits made wholly on his own lines or not.

HIGH CAPACITY CARS IN GERMANY.

The Prussian minister of public works has asked for proposals for the construction of coke cars of 15 metric tons capacity that shall dump and be self-clearing, and has offered prizes of 10,000, 7,500 and 5,000 marks for the best designs. Commenting on the German situation, the *Journal des Transports* says, that as far as car capacity is concerned, the fact that Germany is so far behind France is probably due to the lightness of the construction of its roadway and bridges. The American high-capacity car, with bogie trucks, has been the subject of quite contradictory opinions in Germany. It was at first rejected in 1891, when the tonnage limits were established, but a trial was afterward made in 1899 under the Essen management, with cars of 30 and 40 metric ton capacities, built after the designs of Talbot and the Pressed Steel Car Co. They passed through a period of disfavor but were taken up again, in 1904, by the Royal Bavarian Railways. These trials were no more successful than those which preceded them, and they have finally yielded to the hostility manifested. The objections that are raised to this type of car are that it is too heavy to be moved readily by men, and cannot be handled by existing facilities, such as turntables, transfer tables and the like; with the result that the cars are seldom used except for the transportation of heavy freight, such as rails.

Upon a further examination of the problem, the German engineers have found that the ratio of tare weight to load can be made almost as low for a four-wheeled car as for one equipped with bogie trucks. For example, the 20-ton standard car with side doors and traps at the end weighs about 8.5 tons, while the 40-ton car with bogie trucks will not weigh less than 17 tons. It is quite true that a train of 600 tons can be formed of these high-capacity cars on a length 18 metres (59 ft.) less than that required with the four-wheeled cars, but this advantage is considered small when compared with the inconveniences attending the use of such long and heavy cars.

The technical convention of the German Railroad Union has limited the static load per wheel under a full load to 7,000 kilograms (15,400 lbs.), and the total weight to an average of 3,100 kilograms per metre (2,080 pounds per foot) of length over buffers. Still, on some lines where the superstructure and bridges are of sufficient strength, the weight per wheel is raised to eight metric tons, and the latest instructions regarding the maintenance of the superstructure on the main lines make this load of eight tons the minimum. It would seem, then, that the construction of the 20-ton-capacity cars that run for the most part on the main lines, could be modified in such a way that a load of from 7.375 to 7.60 tons could be carried per wheel, by giving the sides a height of 1.8 metres

(5.9 feet), so that they could be loaded with 21 tons of coal or 20 tons of coke.

Independent of this increase of capacity there is a demand in German industrial circles for self-dumping cars. Up to the present the cars of this character, that have been built in Germany, have been vehicles intended for the transportation of special bulk loads such as ore, coal, broken stone, limestone and similar products, and usually make the return trip empty. In certain places, where self-dumping cars can be used to advantage, they are coming into service; especially for carrying supplies to the large manufacturing establishments of the Rhenish provinces and Westphalia.

Their use is naturally subordinate to the construction of suitable sidings and chutes. Hopper bottom cars have been in use for a number of years in the valley of the Saare and on the Lahn, because the structures there are suited to them; but they cannot be utilized where this is not the case. In fact the majority of the interests affected prefer the side discharge.

The position taken is that the rapidity and saving, in comparison with hand labor, of the self-dumping feature, is offset by the fact that such cars can only be used with freight that will not be injured by such a method of handling, and that, even then, they can only be used in connection with special discharging facilities. A limitation is thus imposed upon the utilization of these cars which is a serious obstacle to an increase of their numbers. It may also be added that they cost about 50 per cent. more than the common type of car, and that the ratio of the tare to loaded weights is also unfavorable to them.

These observations will show the difficulties that beset the minister of public works in his search for a type of car that shall combine the advantages that seem to be so contradictory: that is to say, an automatic discharge with a first cost and maintenance charges that shall be low enough to permit it to be used in ordinary traffic.

Railroad officers and other interested parties must look for the results of this contest with some curiosity. For, if a satisfactory solution is found, it is very certain that, in order to use the self-dumping car to the best advantage, it will be necessary to overhaul the station facilities at many points, so as to assure a rapid handling of the rolling stock during periods of congested traffic.

The initiative that has thus far been taken by some of the great industries as well as by the Prussian railroad management, has had its imitators. The State Railroad of Hungary, for example, has just given a trial order for the construction of 10 open cars of 30 metric tons capacity, to have movable sides, and for 50 more fitted with the Talbot system of side discharge.

Nothing is given out about any agreement between the New York, New Haven & Hartford and its western connections in regard to car service, so it is to be assumed that the withdrawal of that road from the per diem agreement has gone into effect; and that for western cars now coming east with freight for New Haven lines that company will have to pay a "reasonable" price per day. What this will be remains to be seen. To the notices, heretofore referred to, which the New Haven received from its connections it replied that it was ready to enter into a "reasonable arrangement"; but this was accompanied by three questions, viz.:

"Do you consider it reasonable to charge this company for the use of cars during the four days after delivery, when this company has no use of such cars because of the operation of the law giving consignees four days free of charge between delivery and final unloading?"

"The cars to be delivered by you to this company will vary greatly in value, capacity and condition. How are we to ascertain what would be a reasonable charge per day for any particular car?"

"How would you propose to classify cars and what would you consider it reasonable to charge for the different classes of cars to be delivered?"

It is said that most of the roads replied that they considered the per diem rules a sufficient answer to all the questions. In other words an arbitrary rate is the only practicable rate. As the arbitrary rate now in force everywhere else (fifty cents a day) is at present far below the real value of cars and therefore more favorable to the borrower than to the lender the position of the connection would seem to be strong and that of the New Haven weak. The question quoted above might make an interesting assortment of bones for lawyers to pick, but it is hard to see how they can be worth anything for any other purpose. Possibly the New Haven intends to contest in the courts every car service bill presented to it by its connections; but as the city of New Haven is supposed to be still staunchly orthodox, in spite of the supremacy of the Modernists in Yale University (and the wickedness at Hartford which gives us a four-days-free law) we may hope that the officers of the road will instead follow the advice given in the first Gospel, fifth chapter, 25th verse—to agree with thine adversary quickly, while

thou art in the way with him. Happily, the penal clauses of the Interstate Commerce law probably cannot be made to apply to interchange car service rates, so that the rest of this scripture, about being cast into prison, need not be quoted here.

Canadian Pacific.

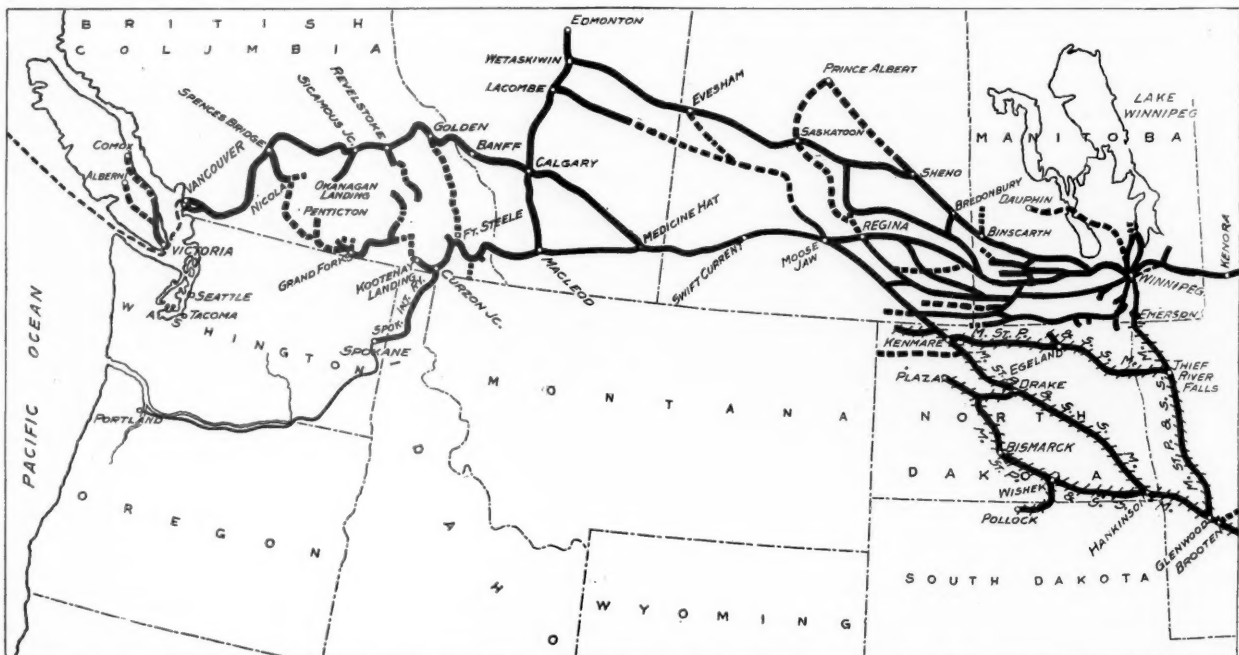
The Canadian Pacific is a great property. There is no railroad like it as a railroad and no railroad corporation like it as a corporation. It owns a line of railroad from the Atlantic ocean to the Pacific, with thousands of miles of branch and connecting lines in between. Besides lake and coast steamships, it owns a line of steamers from Quebec to Liverpool and another from Vancouver to Yokohama; it owns the Dominion Express Company, which operates the express business over its lines and carries more than half the total express traffic of Canada; it also owns the telegraph lines which serve its territory and receives their profits from commercial business. It owns its own parlor and sleeping cars. It owns a controlling interest in two United States railroads—the Duluth, South Shore & Atlantic, which operates nearly 600 miles of line, and the Minneapolis, St. Paul & Sault Ste. Marie, which operates over 2,000 miles. Finally, it owns directly or indirectly 14,800,000 acres of unoccupied land. No other railroad in the world has such a property as this.

Financially, the company belongs more to London than to Montreal or New York. Its 4 per cent. consolidated debenture stock and

stantly increasing in value, after subtracting all expenses of the land grant and a dividend of 1 per cent. on the common stock paid to stockholders in April of this year. It still holds in reserve 12,300,000 acres, besides 2,500,000 acres which it is to receive through a subsidiary.

Of the 12,300,000 acres of land unsold, 8,900,000 acres are agricultural land in Manitoba and Saskatchewan. The British Columbia lands amount to nearly 3,500,000 acres. Some of these, it is known, and many more it is probable, contain valuable mineral deposits. Within a few days the head of the mineral department of the company has been quoted as saying that the Canadian Pacific is spending \$1,500,000 on its coal deposits at Fernie, B. C., and that within a year or two the company will occupy an important position in the coal trade of the province. Much of these British Columbia tracts contain lumber, so that western lands, although not at the moment as readily salable as the agricultural lands further east, may in the end prove much more valuable.

The average price received for the 990,840 acres sold during the last fiscal year was also just under \$6, but this included a large area for which contracts had been made in earlier years at from \$4 to \$5 an acre. The average price realized from lands actually sold within the year was over \$8 an acre. At this average value—and as the price of the lands is rapidly increasing, the company is likely to receive a much higher average for its holdings—the value of the unsold lands is about \$120,000,000, which, added to the \$65,000,000 gross already received, would make a total ultimate value of the



Canadian Pacific System; Western Lines.

4 per cent. preference stock are held almost exclusively abroad, where they are highly regarded. This is proved by the fact that the company received more than par for about \$6,000,000 of these two classes of stock sold during the last year, when safe 4 per cent. stocks of railroads in the United States were selling considerably below par. Even the company's common stock, which is regularly traded in on the New York Stock Exchange, was held at a level 20 or 30 points above the price at which similar United States railroad stocks were selling, by the large holdings and demand for it in England and on the continent.

The Canadian Pacific probably has more concealed equities than any other railroad company in the world. The balance sheet by no means records the total value of its holdings in securities and lands. The Dominion Express Company, all of whose stock is owned, was until 1905 carried at \$113,000. This figure was then pushed up to \$2,000,000 which is said to represent about a sixth of its real value. Common stock of the Canada North West Land Company is carried at par. It has sold on the basis of \$100 shares at \$1,100 a share.

These are cases where the undervaluation of the company's assets can be plainly seen. In the long list of acquired securities given in the report there are undoubtedly other instances of similar if not as great undervaluation. The most important concealed asset, however, is the item of land holdings mentioned in the balance sheet only by a footnote. The company has already received \$58,000,000 in cash or in deferred payments secured by land which is con-

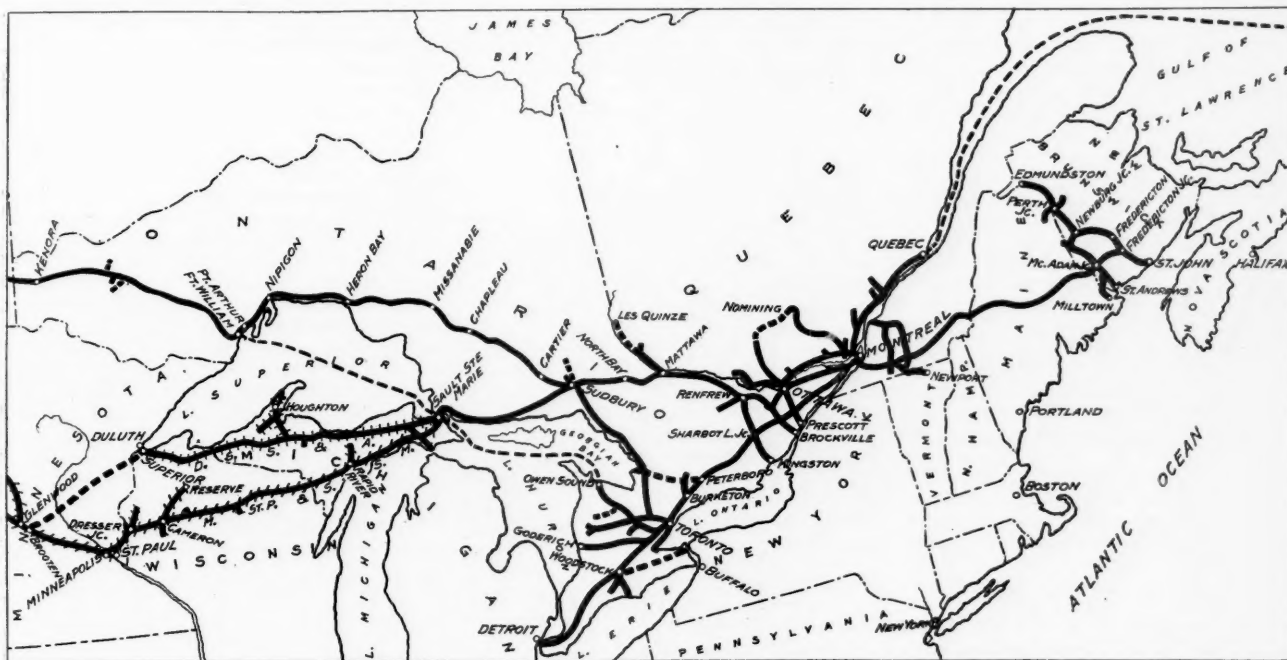
company's land grants of \$185,000,000. This great asset came along with cash subsidies of \$30,000,000 and 713 miles of railroad which cost \$35,000,000 to build, from the Dominion or provincial governments. To-day this seems like lavish generosity, but the Canadian Northwest has now an assured and prosperous future. The first trans-continental train was run on the Canadian Pacific on June 28, 1886. At that time most of its lands were of no immediate value whatever to the railroad or to the country. More by far than to any other one cause Canada owes the wonderful development of her western territory to the Canadian Pacific Railway. The inducements offered, of small immediate but great potential value, were necessary to bring about the construction of such a railroad, as was proved by the failure of earlier similar projects to be carried out without such inducements.

For years the absolute master of the railroad facilities of the western part of Canada, the Canadian Pacific is now facing not far in the future serious competition. In the first place, the Canadian Northern threw out a network of rapidly built lines in the wheat growing regions of Manitoba, the longest of which is now in operation as far as Edmonton, Sask.; next came the defeat of the Conservative party, the ally of the Canadian Pacific, in the Canadian elections, and the Grand Trunk Pacific project, backed by the Liberals under the leadership of Sir Wilfred Laurier and the Grand Trunk Railway, which then held an almost complete monopoly of most of the province of Ontario. This meant more serious competition, for a through line from coast to coast with numerous branches and feed-

ers in the western country was to be undertaken. This competition was particularly serious because backed by government credit. The Canadian Pacific replied by beginning construction of various lines in Ontario paralleling the Grand Trunk mileage and reaching its traffic centers; and, not less important, by the improvement of its existing lines and a rapid occupation of territory in the great Northwest by new lines. Then there came still a third competitor, J. J. Hill of the Great Northern, who promises to build a through low-grade line from Winnipeg to Vancouver with numerous important branches.

This last challenge the Canadian Pacific has already answered. A through freight and passenger service has been begun from Minneapolis and St. Paul over the Minneapolis, St. Paul and Sault Ste. Marie and the Canadian Pacific's main line as far as Medicine Hat, thence through the southern part of British Columbia to a connection with the new Spokane International Railway, recently completed from Spokane north 141 miles—a road on 51 per cent. of whose stock the Canadian Pacific has a 10-year option and with which it has a close traffic arrangement. This brings it to Spokane, one of the most important Hill traffic centers. But the new route does not stop there. By a traffic arrangement between the Harriman interests, who are willing enough to help along competition with the Hill lines, the Oregon Railroad & Navigation brings the "Soo-Spokane route" down the Columbia river to Portland. From St. Paul to Portland this new route is slightly shorter than either the Great Northern or the Northern Pacific, though this will not be so when the

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thou art in the way with him. Happily, the penal clauses of the Interstate Commerce law probably cannot be made to apply to interchange car service rates, so that the rest of this scripture, about being cast into prison, need not be quoted here.

Canadian Pacific.

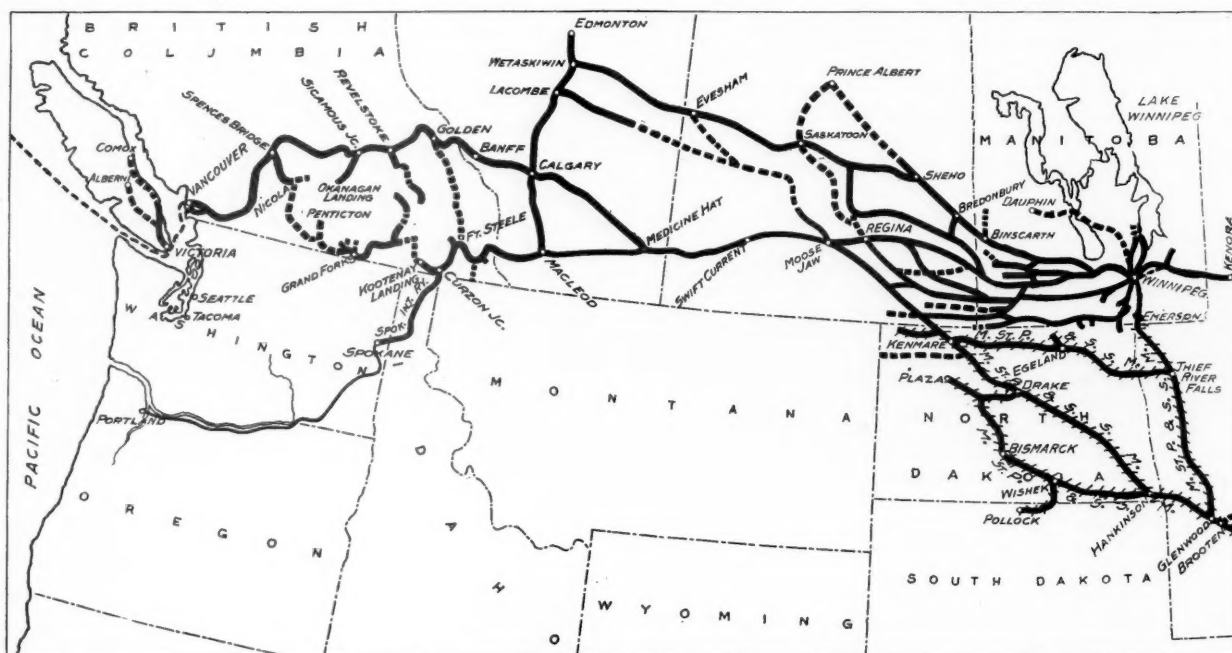
The Canadian Pacific is a great property. There is no railroad like it as a railroad and no railroad corporation like it as a corporation. It owns a line of railroad from the Atlantic ocean to the Pacific, with thousands of miles of branch and connecting lines in between. Besides lake and coast steamships, it owns a line of steamers from Quebec to Liverpool and another from Vancouver to Yokohama; it owns the Dominion Express Company, which operates the express business over its lines and carries more than half the total express traffic of Canada; it also owns the telegraph lines which serve its territory and receives their profits from commercial business. It owns its own parlor and sleeping cars. It owns a controlling interest in two United States railroads—the Duluth, South Shore & Atlantic, which operates nearly 600 miles of line, and the Minneapolis, St. Paul & Sault Ste. Marie, which operates over 2,000 miles. Finally, it owns directly or indirectly 14,800,000 acres of unoccupied land. No other railroad in the world has such a property as this.

Financially, the company belongs more to London than to Montreal or New York. Its 4 per cent. consolidated debenture stock and

stantly increasing in value, after subtracting all expenses of the land grant and a dividend of 1 per cent. on the common stock paid to stockholders in April of this year. It still holds in reserve 12,300,000 acres, besides 2,500,000 acres which it is to receive through a subsidiary.

Of the 12,300,000 acres of land unsold, 8,900,000 acres are agricultural land in Manitoba and Saskatchewan. The British Columbia lands amount to nearly 3,500,000 acres. Some of these, it is known, and many more it is probable, contain valuable mineral deposits. Within a few days the head of the mineral department of the company has been quoted as saying that the Canadian Pacific is spending \$1,500,000 on its coal deposits at Fernie, B. C., and that within a year or two the company will occupy an important position in the coal trade of the province. Much of these British Columbia tracts contain lumber, so that western lands, although not at the moment as readily salable as the agricultural lands further east, may in the end prove much more valuable.

The average price received for the 990,840 acres sold during the last fiscal year was also just under \$6, but this included a large area for which contracts had been made in earlier years at from \$4 to \$5 an acre. The average price realized from lands actually sold within the year was over \$8 an acre. At this average value—and as the price of the lands is rapidly increasing, the company is likely to receive a much higher average for its holdings—the value of the unsold lands is about \$120,000,000, which, added to the \$65,000,000 gross already received, would make a total ultimate value of the



Canadian Pacific System; Western Lines.

4 per cent. preference stock are held almost exclusively abroad, where they are highly regarded. This is proved by the fact that the company received more than par for about \$6,000,000 of these two classes of stock sold during the last year, when safe 4 per cent. stocks of railroads in the United States were selling considerably below par. Even the company's common stock, which is regularly traded in on the New York Stock Exchange, was held at a level 20 or 30 points above the price at which similar United States railroad stocks were selling, by the large holdings and demand for it in England and on the continent.

The Canadian Pacific probably has more concealed equities than any other railroad company in the world. The balance sheet by no means records the total value of its holdings in securities and lands. The Dominion Express Company, all of whose stock is owned, was until 1905 carried at \$113,000. This figure was then pushed up to \$2,000,000 which is said to represent about a sixth of its real value. Common stock of the Canada North West Land Company is carried at par. It has sold on the basis of \$100 shares at \$1,100 a share.

These are cases where the undervaluation of the company's assets can be plainly seen. In the long list of acquired securities given in the report there are undoubtedly other instances of similar if not as great undervaluation. The most important concealed asset, however, is the item of land holdings mentioned in the balance sheet only by a footnote. The company has already received \$58,000,000 in cash or in deferred payments secured by land which is con-

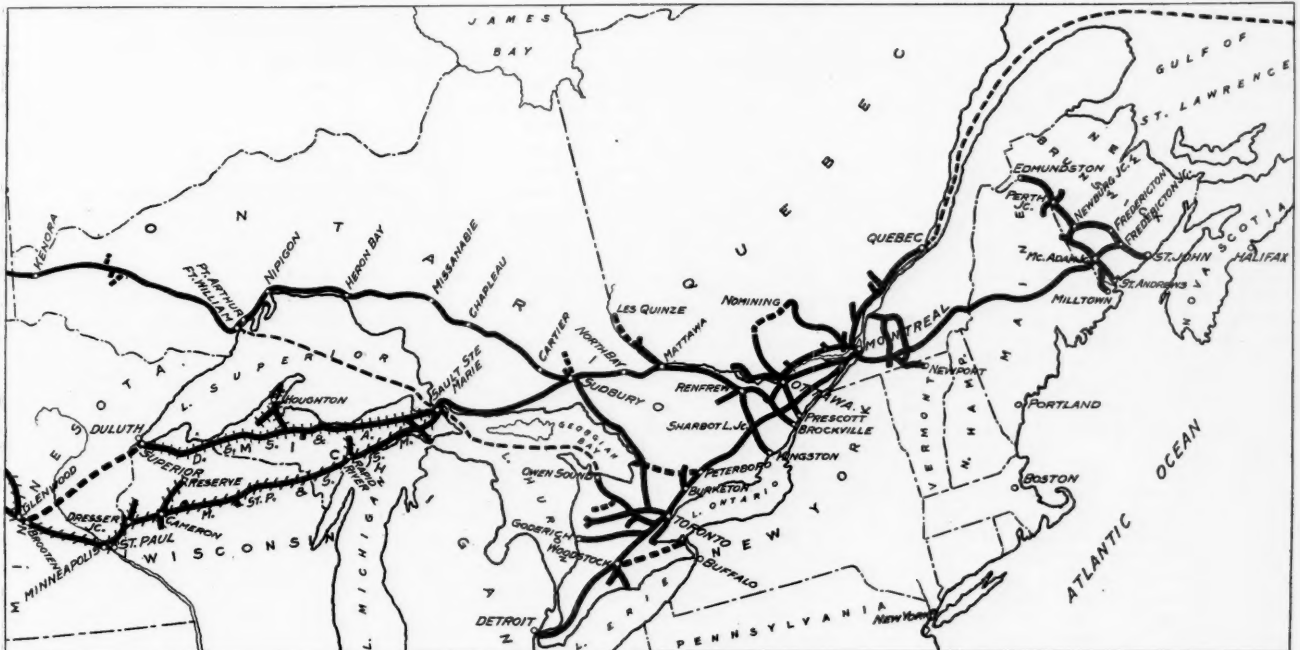
company's land grants of \$185,000,000. This great asset came along with cash subsidies of \$30,000,000 and 713 miles of railroad which cost \$35,000,000 to build, from the Dominion or provincial governments. To-day this seems like lavish generosity, but the Canadian Northwest has now an assured and prosperous future. The first trans-continental train was run on the Canadian Pacific on June 28, 1886. At that time most of its lands were of no immediate value whatever to the railroad or to the country. More by far than to any other one cause Canada owes the wonderful development of her western territory to the Canadian Pacific Railway. The inducements offered, of small immediate but great potential value, were necessary to bring about the construction of such a railroad, as was proved by the failure of earlier similar projects to be carried out without such inducements.

For years the absolute master of the railroad facilities of the western part of Canada, the Canadian Pacific is now facing not far in the future serious competition. In the first place, the Canadian Northern threw out a network of rapidly built lines in the wheat growing regions of Manitoba, the longest of which is now in operation as far as Edmonton, Sask.; next came the defeat of the Conservative party, the ally of the Canadian Pacific, in the Canadian elections, and the Grand Trunk Pacific project, backed by the Liberals under the leadership of Sir Wilfred Laurier and the Grand Trunk Railway, which then held an almost complete monopoly of most of the province of Ontario. This meant more serious competition, for a through line from coast to coast with numerous branches and feed-

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ance of \$4,300,000 still available. For this reason no new appropriation was made. A good deal of money was received during the year from sources other than those shown in the income account. The total receipts from land sales for the year were \$8,300,000. Against this must be set off \$1,500,000, the final payment to the Dominion government, on account of land grant bonds, thus leaving the land holdings free and clear to the company. There was \$15,800,000 received from sale of new common stock and something over \$6,000,000 from sales of preference and of consolidated debenture stock.

The increases in earnings were large. Freight earnings were nearly \$46,000,000, against \$39,500,000 in the previous year. Passenger earnings increased from \$16,000,000 to \$19,500,000. These returns indicate the general and unprecedented prosperity of the Dominion, as they follow a year in which the increases over the previous year had been very large. In passenger earnings the great strength of the Canadian Pacific is the large amount of through business, much of it from one seaboard to the other, which goes over its line. Besides the traffic which would naturally come to it from Canadians, Englishmen travelling on this continent as a rule choose the Canadian Pacific for at least one way across, partly because of patriotic feeling and partly because the Canadian Pacific, as a railroad, is so well known abroad. Travelers from the United States also take the trip in great numbers because of the magnificent scenery through the Canadian Rockies, which is unequaled by any transcontinental road in the United States. This large amount of through passenger business does not seem to be reflected in the passenger-mile rate, which is 1.83 cents per passenger per mile, but this figure is much affected by the low rates and large numbers of immigrant passengers.

The bulk of the freight traffic is in two classes of business—grain and lumber. Flour, live stock, fire wood and manufactured articles are listed separately, and all other freight traffic besides these six classes is bulked together in one group, which amounted last year to 4,800,000 tons. The growth of the grain traffic through the tremendous expansion of the road's mileage in the grain-growing districts of Manitoba and Saskatchewan is shown by a large increase in grain tonnage during the last two years. In 1905 there were 59,700,000 bushels of grain carried; in 1906, 82,200,000 bushels, and last year, 93,200,000 bushels hauled by the road. It is evident from the fact that all other articles besides the six classes already mentioned amount altogether to less than 4,800,000 tons, that the coal traffic of the road is not large. The development of the coal measures in British Columbia should result in greatly increasing this article of traffic. Another kind of heavy traffic which is likely to increase in the future is iron ore. Large deposits of iron ore have recently been opened commercially north of Lake Superior, and the Canadian Pacific will receive the haul on these ores from the mines to the manufacturing centers in the East.

Maintenance of way expenditures were \$1,115 a mile last year, which appears to be a liberal figure, first, because the proportion of branch-line prairie mileage is large, and, second, because on the lines in the East, south of the St. Lawrence, traffic is light. The cost per mile was about \$1,050 in 1906 and \$1,000 in 1905. Maintenance of equipment figures are not given in detail. The increase in the cost of conducting transportation was very large. This account stood at \$23,800,000, against \$18,800,000 in 1906, a rise of \$5,000,000, or 26 per cent. Detailed figures are not given under this account, but it is clear that not only the severity of the winter but the greater cost of labor and supplies has had its effect in raising the total of ordinary running expenses. Largely on this account the operating ratio for the year increased from 63 per cent. in 1906 to 65 per cent. last year.

Aside from these handicaps, the road was more efficiently operated than in the previous year. An increase of 193,000,000, or 22 per cent., in passengers carried one mile was taken care of with an increase of only 12 per cent. in passenger-train mileage. In the same way there was an increase of 629,000,000 ton-miles, or 10 per cent., against which there was an increase of only 6 per cent. in freight-train mileage. Empty freight car mileage decreased 10,700,000 car-miles, or 11 per cent., and the revenue trainload rose from 279 tons in 1906 to 295 tons last year. The freight-train earnings per train-mile increased 11 per cent., and the freight-train earnings per mile of road from \$4,440 per mile to a little more than \$5,000 a mile, a gain of 13 per cent. The passenger-train earnings per mile increased even more than this—17 per cent.

Most of the President's comments in the report are as usual taken up with description of new construction. A branch from Moose Jaw, on the main line in Saskatchewan, northwesterly 50 miles, has already been authorized. This is shown on the map as a completed road. It will shortly be continued 100 miles further. A branch is also projected from Regina, Sask., to Saskatoon, 165 miles. The cost of these branches is to be met by an issue of 4 per cent. consolidated debenture stock. The Regina-Saskatoon line, as shown by the map, is projected further to reach Prince Albert. Up to about a year ago the Canadian Pacific leased the Qu' Appelle, Long Lake & Saskatchewan Railway, which runs from Regina, via Saskatoon, to Prince Albert. This was taken over by the Canadian Northern, which held it during the last winter. In the spring com-

plaint was made that the road had not been operated with any regularity by the Canadian Northern, that at times it had been entirely abandoned, and, therefore, that the Canadian Northern should not be allowed to continue to hold the road. This matter does not appear to have been definitely settled at this time, but if the road should be returned to the Canadian Pacific the branch from Regina to Saskatoon and thence to Prince Albert will probably not be built.

In carrying on construction work the scarcity of labor has made progress slow. Of the 747 miles west of Lake Superior under way at the time of the previous annual report, two-thirds of the grading has been finished, 270 miles of track laid and the rails and fastenings for the rest of the mileage are on hand. In eastern Canada the line from Guelph, Ont., to Goderich, on Lake Huron, is about to be put in operation. On the Walkerton & Lucknow, which is to run from Proton, Ont., to Walkerton, 38 miles, 20 miles of grading was done. On the cut-off which runs on the east side of Georgian Bay, to give the Canadian Pacific its own route between Toronto and the main line, the whole 226 miles is to be ready for freight traffic by the end of the year. This is the line which runs from Kleinburg, Ont., north to Sudbury. It was supposed that \$30,000 a mile would cover the cost of its construction, but owing to the difficult character of the country and the greater cost of labor and material, the cost has exceeded the original estimates, and additional funds to an amount not exceeding \$10,000 more a mile, are to be authorized. The probable completion of 200 miles of second track between Winnipeg and Fort William has already been mentioned. Second track is also being laid between Ste. Anne's, Que., and Smiths Falls, Ont., 108 miles, of which 50 miles are to be finished before the end of the year and the rest in 1908.

The progress of the Canadian Pacific during the next ten years, the effect on it of the competition just beginning, and the development of Canada which is likely to come about through the great amount of new railroad construction there under way, are likely to be peculiarly interesting. There is a further field for interesting speculation in the probable value of the company's total assets, as it will work out in its effect on the returns to stockholders. The obligations owed to the Dominion government on account of land grant bonds are now fully paid up and all receipts from land sales are a free asset of the company, and, therefore, of the stockholders. Sooner or later there must come a distribution of these assets to the holders of the company's common stock. It is this unknown future equity which largely accounts for the high price at which Canadian Pacific stock is held.

The principal results of the last two years' operations are summed up in the following table:

	1907.	1906.
Mileage worked	9,416	8,777
Freight earnings	\$45,885,968	\$39,512,973
Passenger earnings	18,528,578	16,041,616
Miscellaneous earnings* ..	6,079,744	5,408,161
Gross earnings	72,217,518	61,669,758
Maint. way and structures ..	10,110,957	9,105,250
Maint. of equipment	9,083,249	7,369,566
Conducting transportation ..	23,765,138	18,789,696
Operating expenses†	46,914,219	38,696,446
Net earnings	25,303,309	22,973,313
Net income	18,376,034	16,012,216

*Including earnings from sleeping cars, express elevators, telegraph and miscellaneous; also profit from ocean steamships, Mail earnings not included.

†Including parlor, sleeping car and commercial telegraph expenses; also expenses of lake and river steamers.

Minneapolis, St. Paul & Sault Ste. Marie.

The Minneapolis, St. Paul & Sault Ste. Marie is a grain carrier, the bulk of whose mileage is in the North Dakota and Minnesota prairies. Its through lines are from Minneapolis to Sault Ste. Marie, from Minneapolis to a Winnipeg connection and from Minneapolis to a Canadian Pacific through connection at the boundary line between North Dakota and Saskatchewan. Within the last two years it has been expanding rapidly by building new mileage in the wheat country of North Dakota. The road is shown on the map of the Canadian Pacific published in another column. The line from Thief River Falls, Minn., west to Kenmare, N. Dak., 296 miles, was finished more than a year ago. It runs through a rich agricultural country where new towns sprang up even before the opening of the railroad, and business and agricultural development have been rapid. Other recent extensions have been in the neighborhood of the Missouri river in North Dakota, particularly the line from Drake to Plaza, on which about \$1,400,000 was spent during the last fiscal year.

The effect of this new mileage is shown in various ways in the results of the last year's operations. There was a falling off both in passenger and freight density. There were 52,000 passengers carried one mile per mile of road, against 55,000 in 1906; and 519,000 tons of revenue freight, against 537,000 in 1906. At the same time there was a heavy falling off in the amount of company freight carried. The non-revenue freight ton miles fell from 191,000,000 in 1906 to 169,000,000 in 1907, and the average trainload, including revenue and non-revenue freight, shows a decrease. On the other hand, the

revenue trainload increased from 329 tons to 334 tons. The main line revenue trainload was 385 tons against 382 tons in 1906, and the branch line, 202 tons against 173 tons in 1906. The reduction in the amount of company freight carried is, of course, due to the large amounts of construction material for the new extension carried in the previous year. A reduction in passenger and freight density is the usual result of the opening of any considerable amount of pioneer mileage.

The gross earnings of the year increased 11 per cent. over 1906. They were \$12,900,000, against \$11,600,000. The increase came largely in freight earnings, which were larger by over \$1,000,000 than in the previous year. The increase in gross earnings was more than wiped out by the greater cost of operation. Operating expenses rose from \$5,800,000 in 1906 to \$7,400,000, an increase of 28 per cent. This was due in particular to the difficulties of operation last winter, which was the most severe within the remembrance of living operating officers and which fell on the "Soo" line with particular and remarkable severity. The increase in operating expenses also was due to the greater cost of labor and of almost every class of material and supplies. The gross earnings at the same time were somewhat reduced by the general car shortage. As a result of all these factors the operating ratio rose from 50 per cent. to 58 per cent., and net earnings decreased from \$5,800,000 in 1906 to \$5,500,000 last year, a decrease of 5 per cent. Fixed charges were \$300,000 more than in the earlier year, leaving net income of \$2,600,000, smaller by nearly \$700,000 than in the 1906 year—this while gross earnings per mile of road increased even with the handicap of the new extension from \$5,729 in 1906 to \$5,775 last year.

The increase in operating expenses came in both classes of maintenance as well as in conducting transportation. Maintenance of way was larger by nearly \$500,000, maintenance of equipment by nearly \$400,000 and conducting transportation by \$800,000. Even with this increase, maintenance of way per mile stands at only \$655, a very low figure. It is, however, much larger than in 1906, when only \$476 per mile was spent on way and structures. Even with its large amount of prairie mileage, the larger of these figures is much too low to maintain the physical condition of the permanent way. Repairs and renewals cost \$2,370 per locomotive, against \$2,307 in 1906; \$878 per passenger car, against \$957 in 1906, and \$42 per freight car, against \$39 in 1906. Especially with renewals included, this amount per freight car is not nearly liberal enough to properly maintain the freight car equipment.

There were considerable additions to the equipment during the year, the principal of which were 75 locomotives and 1,000 box cars. The total expenditures on new equipment were about \$3,000,000. Maintenance of way betterments, costing a little over \$1,000,000, were charged to the betterment fund, to which only \$800,000 was appropriated out of income against \$1,050,000 in 1906. More than half the expenditure was on grade reductions on the Minnesota division which carries the road's through traffic to a connection with the Canadian Pacific at Sault Ste. Marie.

The following are the costs of some of the individual conducting transportation accounts compared with the previous year:

	1907.	1906.
Engine and roundhouse men ..	\$629,000	\$562,000
Fuel for Locomotives	1,263,000	997,000
Water supply for locomotives..	56,000	40,000
Oil, tallow and waste	32,000	27,000
Other supplies, locomotives ..	21,000	12,000
Freight train service	443,000	368,000
Supplies and expenses	36,000	29,000
Switch, flag and watchmen ..	124,000	36,000
Telegraph expenses	142,000	115,000
Station service	357,000	282,000
Damage and loss to freight and baggage	76,000	53,000
Injuries to persons	217,000	73,000
Operating yards, tracks and terminals	143,000	106,000

The greatly increased cost of carrying on its transportation operations is sharply shown in these contrasted figures. There were decreases in the cost of advertising and in the amount spent for outside agencies; also in damage to property, including live stock. Under general expenses, salaries of general officers increased from \$52,000 to \$67,000.

The balance sheet shows an increase from \$40,000 to \$1,948,000 in equipment trust notes outstanding. The current liabilities stood at \$2,200,000 on June 30, 1907, against \$1,580,000 the year previous. At the same time there was little increase of current assets. Cash on hand at Minneapolis, St. Paul, New York and London amounted to \$2,680,000, against \$3,180,000 the year before.

Funds for new equipment and better terminal facilities at Minneapolis, St. Paul and other principal points to the extent of about \$2,700,000 have been advanced from time to time from surplus earnings. The company's business has grown so fast that large expenditures have been required to keep up with it. In order to replace these advances and to provide funds for other improvements which are greatly needed the stockholders, on September 17, authorized a doubling of the company's common and preferred stock, the total of which now stands at \$42,000,000. Of the new stock \$4,200,000 is now being offered to stockholders at par. Thus the

present time marks the expansion of the road's capital to keep pace with its earnings and prospects.

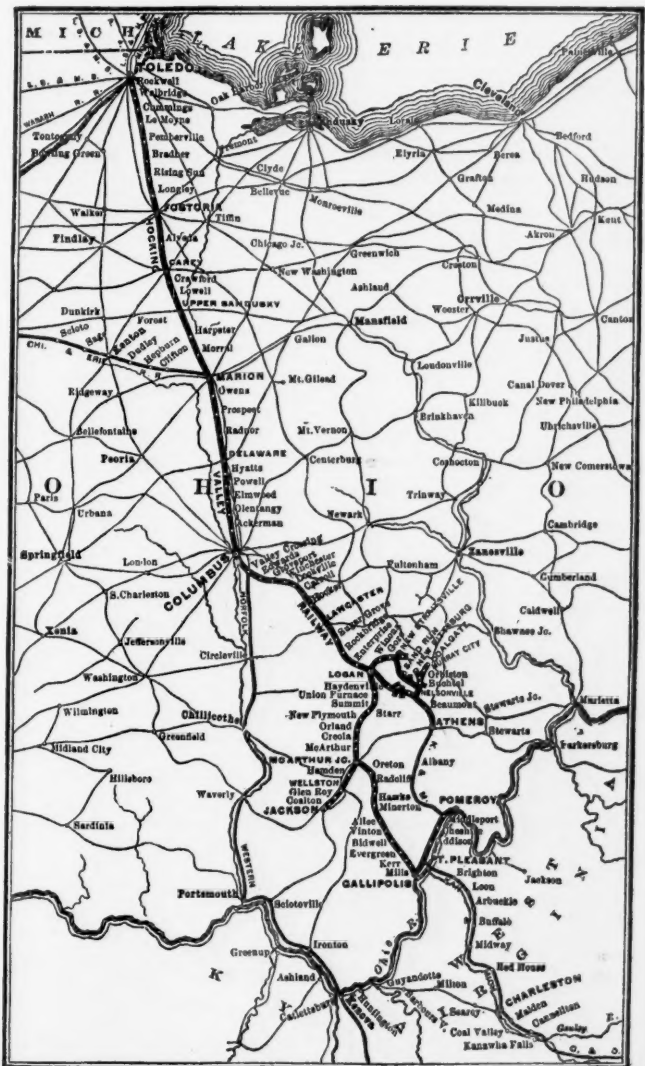
The most important extension now projected is a line from Brooten, Minn., northeast about 200 miles to Duluth, which will give the "Soo" line a direct connection with the Duluth, South Shore & Atlantic, also controlled by the Canadian Pacific, and will make it possible for it to carry traffic from North Dakota direct to the head of the lakes. Work on this contract is already under way.

The last three years results are given below:

	1907.	1906.	1905.
Mileage worked	2,233	2,020	1,774
Freight earnings	\$9,506,477	\$8,468,675	\$6,387,248
Passenger earnings	2,655,549	2,427,539	1,799,034
Gross earnings	12,892,079	11,574,462	8,116,622
Maint. way & structures	1,495,147	1,023,734	743,693
Maint. of equipment	1,440,086	1,090,480	881,702
Conducting transportatn	4,259,848	3,450,288	2,687,174
Operating expenses	7,435,549	5,784,560	4,502,607
Net earnings	5,458,530	5,789,902	4,214,014
Net income	2,608,686	3,267,686	2,063,415

Hocking Valley.

The plan for the consolidation of the Hocking Valley and the Kanawha & Michigan was announced last fall, but the completion of the merger has been held up ever since because of the suit brought by the Attorney-General of Ohio, attacking the ownership by the Hocking Valley of the stock of the Toledo & Ohio Central,



Hocking Valley.

which is a parallel line. If the consolidation is brought about, the \$15,000,000 4 per cent. preferred stock of the Hocking Valley is to be refunded in new 4 per cent. bonds and new stock is to be exchanged for Kanawha & Michigan stock. The annual report of the Hocking Valley for the year ended June 30, 1907, shows 11 per cent. earned on the \$11,000,000 common stock after the \$600,000 preferred dividend. Dividends amounting to 3½ per cent. were paid on common, as compared with 3 per cent. in the previous year. The com-

pany's share, through stock ownership, in the surplus earned by the Toledo & Ohio Central and the Kanawha & Michigan would, if these surpluses were distributed as dividends, bring the amount available for Hocking Valley common up to about 23 per cent.

Aside from the increase in operating expenses because of the high cost of labor and material, the Hocking Valley has had to meet two expenses not common to all companies. These were the flood in the Hocking district last March, and the renewal of a large number of freight cars retired from service because they were so old or so small that it was not worth while to fit them with air-brakes, which change had to be made before September 1, 1907, on all freight cars interchanged with other lines. The cost of flood repairs was about \$85,000 and most of this was charged to operating expenses for the year. The cost of the renewals of freight cars were not entirely paid out of the equipment reserve fund; it seems that the annual appropriations to cover depreciation of rolling stock have heretofore been too small. This depreciation fund amounted to \$595,000 on June 30, 1906, and \$658,000 was added during the year. Of this amount, \$852,000 was used to cover 40 per cent. of the cost of new coal and box cars and the entire cost of three locomotives bought for renewal, and for rebuilding and betterment of freight and work cars; while the rest is reserved to pay the semi-annual instalments for three years on the equipment trust notes issued for these cars. The company now has 14,779 freight and work cars, as compared with 14,083 at the end of the previous year. The new equipment ordered consists of 2,000 steel underframe coal cars, of which 1,100 were for renewals and the rest additions, and 850 box cars, of which 550 were for renewals. All the box cars and 1,170 coal cars had been delivered on June 30. The cost of this additional equipment, as well as that of eight new passenger train cars, was \$393,000, which includes cash payments and reserve for instalments payable on equipment trust notes. This amount was appropriated from income. On June 30, 1906, there was in the treasury \$194,000, the remainder of the proceeds from the sale of 4½ per cent. consolidated mortgage bonds, which have been used from year to year since the creation of the bonds at the formation of the company in 1899. This amount could, under the mortgage, be applied to additions to property and the retirement of existing equipment obligations; all of this was used during the year and \$18,000 additional appropriated from the year's income. New repair shops and yards at Logan, Ohio, to cost \$300,000 were authorized; work was begun and \$12,000 has so far been spent on them.

Gross earnings increased from \$6,440,000 to \$6,907,000; the increases in coal earnings and passenger earnings were less in proportion than the increase in freight. Tons of freight carried increased from 8,600,000 tons in 1906 to nearly 8,900,000 in 1907, and

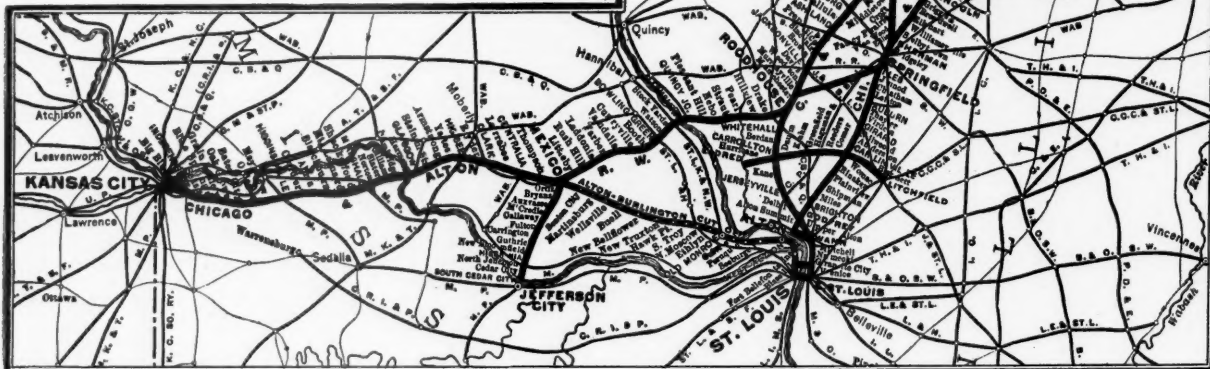
creased from \$510 per car to \$523 per car, and the maintenance of freight and work cars increased from \$63 per car to \$71.

The principal results of operation are as follows:

	1907.	1906.
Mileage worked	347	347
Passenger earnings	\$807,210	\$796,828
Coal earnings	2,900,340	2,802,776
Freight earnings	2,494,277	2,238,833
Gross earnings	6,907,048	6,439,809
Maint. way and structures	806,625	688,461
Maint. of equipment	1,491,995	1,325,449
Conducting transportation	2,052,755	1,831,139
Operating expenses and taxes	4,709,809	4,181,744
Net earnings	2,197,239	2,258,035
Net income	1,827,486	1,772,934
Surplus for the year	313,479	753,369

Chicago & Alton.

No railroad during the past year has been the subject of more general comment and interest than the Chicago & Alton. The facts of its reorganization in 1899—matters of record as they were—when given the prominence of a public investigation at a time when railroad financial management was of particular interest, stamped it in the public mind as the crowning example of the methods of high finance. Without attempting to discuss the justice or injustice of all the details of the reorganization, it may be well



Chicago & Alton.

the greater part of this increase was in freight received from connecting roads and other carriers. The average haul increased from 116 miles to 122 miles. During the previous year, most of the increase in traffic had come from the building up of local freight business owing to the growth of industrials in the territory served by the road. It seems from the above figures that this business has fallen off somewhat, particularly since the tonnage of manufactures originating on the road was only 643,000 in 1907 as compared with 663,000 in 1906. The average train load on the entire line increased from 608 tons to 625 tons, the figures for the main line being 655 tons, an increase of 24 tons, while that for the River division was only 250 tons, which compares with the high record last year of 271 tons. The highest figure for the entire line, 678 tons, was reached in 1902. The revenue per ton mile decreased from 0.505 cents to 0.496.

Maintenance of way charges show a large increase, having been \$1,984 per route mile in 1906 and \$2,325 in 1907; part of this increase is due to the unusual repairs made after the flood already mentioned. Repairs and renewals of locomotives cost \$2,151 in 1907, \$2,169 in 1906 and \$2,579 in 1905. Passenger car maintenance in-

to mention that, taken in the large, it amounted simply to the substitution of a large par value of securities of low return for a small par value of securities of high return, the natural effect of this substitution being sooner or later reflected in the market price. It is noticeable, in view of the bitter criticism of the reorganization which has often charged that the property was wrecked, that in the past year, after paying the full dividends on the preferred stock, there remained a surplus equal to over 5 per cent. on the total amount of common stock outstanding.

The striking thing about the Alton's income record for the year is that there was nearly three times as large a proportionate increase in net earnings as in gross earnings, and, furthermore, that there was scarcely any increase at all in the cost of conducting transportation. Gross earnings were \$12,800,000, a gain of \$1,200,000, or 10½ per cent. Operating expenses increased only a little more than \$200,000, or 3 per cent., leaving net earnings larger by over \$1,000,000, or 27 per cent., than in the preceding year. This unusual record was not brought about by skimping the maintenance accounts, for as much was spent on maintenance of way per mile operated as in the year before, and more on repairs and

renewals per locomotive, passenger car and freight car. These unit maintenance expenditures were as follows:

	1907.	1906.
Maintenance of way, per mile.....	1,473	1,472
Repairs and renewals per locomotive.....	2,599	2,406
Per passenger car.....	794	791
Per freight car.....	53	45

Freight earnings increased 12 per cent., revenue freight tonnage 23 per cent., and revenue freight ton mileage 18 per cent. As there was no change in the operated mileage up to the end of the fiscal year, the freight density also was increased 18 per cent. In spite of the fact that the ton-mile rate decreased 5 per cent., there was a small increase in the earnings per train-mile. Freight earnings per mile of road increased from \$7,730 to \$8,637, or 12 per cent.

The gain in passenger earnings was 7 per cent., with an increase of 9 per cent. in passengers carried one mile. The average number of passengers per train-mile rose from 49 in 1906 to 55, thus increasing this important passenger economy by 14 per cent. The earnings per train-mile in consequence increased 12 per cent. in spite of a slight decrease in the passenger-mile return.

The increase of 15 per cent. in the number of ton-miles of revenue and company freight was handled with an increase of only 10 per cent. in freight-train mileage. At the same time the average trainload increased from 381 tons to 409 tons of revenue freight, and from 418 tons to 439 tons of all freight, while the average loaded car carried 21 tons, against 19 tons in 1906. The loaded car miles eastbound increased 15 per cent., against a slight decrease in the loaded car mileage west. The empty car mileage eastbound at the same time decreased 39 per cent., while the empty car mileage west increased 25 per cent. It will be interesting to observe what effect the ownership of the Chicago & Alton by one of its eastern connections will have on these figures of loaded and empty car mileage.

The form of annual report is similar to that adopted by the companies controlled by the Rock Island Company, and is, in consequence, fuller than previous Chicago & Alton reports. The current report for instance contains 35 pages against 26 pages in the report of 1906. The income account is fuller and more clear, and the balance sheet and the consequent changes in the capital accounts of the company are set down in much greater detail. Operating expenses are given in detail for the first time. Each bond issue of the funded debt is carefully described.

The most important improvement was the completion of the air line from Iles, just south of Springfield, Ill., southwest to Murrayville, 34 miles, which is just being put in operation. This line is tangent and has no grades steeper than 16 ft. in a mile in either direction. Ten per cent. of the cost of the whole line has been used in avoiding grade crossings with other railroads, of which there is only one. The line is equipped with modern water stations and 3,400-ft. passing sidings, every six or seven miles. The stations are all built on a uniform plan; the rails are 80-lb., and the line is being thoroughly ballasted with gravel. This cut-off shortens the route from Chicago to Kansas City by five miles and gives the Chicago & Alton, by different routes part of the way, two tracks from Chicago to Murrayville, 222 miles. Through trains from the Kansas City line to the East can now reach the main line at Springfield instead of having to go north as far as Bloomington. The following table shows the advantages of the new route over the old between Roodhouse and Bloomington. On the basis of these figures and last year's traffic the cut-off will save 55,000 train miles on eastbound freight traffic alone.

Old and New Routes—Roodhouse to Bloomington.

	Old line.	New line.
Distance in miles.....	110.5	105.4
Total rise, ascending grades, ft.....	1,059.0	512.0
Total fall, descending grades, ft.....	934.0	387.0
Total degrees of curvature.....	940.0	226.0
Maximum degrees of curvature.....	5.0	2.0
Controlling grade:		
Northbound, ft. per mile.....	38.6	15.3
Southbound, ft. per mile.....	52.8	37.4

The Toledo, St. Louis & Western, which has a through line from St. Louis to Toledo, has bought control of the Chicago & Alton from the Rock Island Company, making payment in collateral trust bonds secured by Chicago & Alton stock. It is not improbable that these two roads—together with the Iowa Central and the Minneapolis & St. Louis—will be brought into a more or less compact system, whose extent can be judged from the map published in the *Railroad Gazette* of August 30, 1907. The purchase of the Alton by the "Clover Leaf" seems to be more to the advantage of the purchaser than of the larger road. If eastbound traffic from Kansas City over the Chicago & Alton is to be, so far as possible, turned over to the "Clover Leaf" in the St. Louis territory, the Alton will lose the benefit of the haul north either to Bloomington, where it connects with the Lake Erie & Western and the 'Big Four'; Dwight, where it crosses the east and west line of the Chicago, Indiana & Southern; Joliet, the Michigan Central connection; Chappelle, where it meets the Lake Shore and the Chicago Terminal Transfer; or Chicago, with its many eastbound

lines. Through any one of these junctions the Chicago & Alton gets a longer haul than through a junction with the "Clover Leaf" at St. Louis. The Alton lines between St. Louis and Chicago, however, go far toward being self-supporting, as the Alton has a strong hold on Chicago-St. Louis traffic, and there is important coal and agricultural traffic in the territory between the two cities.

The results of operation are summarized below:

	1907.	1906.
Mileage worked.....	970	970
Freight earnings.....	\$838,957	\$7,501,081
Passenger earnings.....	6,359,985	3,401,443
Gross earnings.....	12,809,426	11,586,095
Maint. way and structures.....	1,429,156	1,427,875
Maint. of equipment.....	1,598,023	1,407,875
Conducting transportation.....	4,664,722	4,654,077
Operating expenses.....	8,024,452	7,818,904
Net earnings.....	4,784,974	3,767,191
Net income.....	1,827,561	1,009,980
Year's surplus.....	1,010,229	194,974

NEW PUBLICATIONS.

Recollections of an Ill-Fated Expedition to the Headquarters of the Madeira River in Brazil. By Neville B. Craig, in co-operation with members of the Madeira and Mamoré Association. 480 pages, 6 in. x 8 1/4 in. Published by J. B. Lippincott Co., Philadelphia. Price, \$4.00.

In 1878 a bold and apparently well designed enterprise in railroad survey and construction in South America was begun and quickly ended in disastrous failure. It was brilliant and dramatic in conception, but in the execution the drama became a succession of tragedies. The money loss was enormous, as money was counted in that generation; hundreds of lives were sacrificed, while hardships and jungle fevers damaged to an extent not measurable the health of the bold engineers who survived. Nearly one-fourth of those who sailed in the ships sent from Philadelphia to the Amazon and Madeira were drowned or killed by malignant fevers.

Bolivia has more than half a million square miles; is rich in gold, silver, iron, coal, rubber and lands for grain and grazing. It has no sea coast, and on the west the Andes mountains form a barrier, not insurmountable by railroads, but a costly obstacle which when surmounted still leaves a long route by the Pacific ocean and Cape Horn to reach Atlantic ports. From the Atlantic ocean the Amazon is navigable, as is also its tributary, the Madeira, to within about 150 miles of the northwestern boundary of Bolivia. The building of about 240 miles of railroad from this point, rounding the rapids of the Madeira and the lower part of the Mamoré river would make accessible the navigable waters of the Mamoré and its tributaries in Northern Bolivia. It would open an empire to trade.

This magnificent possibility attracted the imagination of a pioneer genius, Col. Geo. E. Church, and, with a faith that never faltered and an ardor that a succession of rebuffs and failures during eight years never cooled, he lived to see his enterprise begin with every prospect of success and end miserably. He was a thorough engineer, and a diplomat with such a winning way that the Brazilian Emperor, the Bolivian parliament and British financiers were alike amenable. And after the British organization had tried and failed, he turned unabashed to his own country and found powerful men ready to help. Franklin B. Gowen, of the Reading Railroad, and Col. Thomas A. Scott, of the Pennsylvania, were alike zealous, although hostile to each other. A son of Col. Scott organized the firm of Mackie, Scott & Co. and contracted to furnish the river navigation. P. & T. Collins, rich and successful railroad builders, contracted to build and equip the Madeira & Mamoré Railroad.

In January, 1878, the first ship, the "Mercedita," overloaded and wretchedly equipped, succeeded in carrying 54 engineers, with laborers, a locomotive and railroad material from Philadelphia, up the Amazon and Madeira, to the railroad's starting point. The second ship, the "Metropolis," was wrecked off Currutuck beach and 90 of the adventurers were drowned. In general, the undertaking failed because of bad financing; in detail, the story of the summer of 1878 is a record of heroism. The survey was made, a short piece of road was built, and then it was all over. Of the engineers, not many survive. Among them are George W. Creighton and C. A. Preston, superintendents on the Pennsylvania Railroad; Joseph S. Ward, of the Reading; Charles W. Buchholz, Consulting Engineer of the Erie, and O. F. Nichols, Consulting Engineer of New York city bridge department. The maps in the book are excellent.

Development of the Locomotive Engine. By Angus Sinclair. 668 pages; 6 in. x 8 1/4 in. Published by Angus Sinclair Publishing Co. Price, \$5.00.

The personality of the author, his geniality and his harshness, is apparent in the 33 chapters of this entertaining book. Although he is accurate, so far as can be determined by a hasty reading, in the essential facts and in the more than 400 engravings and drawings which richly illustrate the text, nevertheless the inferences, the sweeping judgments on the great men who have had to do with locomotive development, are frequently not those with which the reader can agree. To disagree with Angus, however, is not at all disagreeable either to him or to his friends. An example of this is the following comment on the life work of the great mechanical

engineer of the London & North Western Railway: "I never heard of any lavish praise being expended on the Webb compounds outside of the designer's immediate friends." And yet most people recognize that Mr. Webb was a great and bold, but too self-confident experimenter; ahead of his time, and one to whom the profession owes much, although he cost his company a great deal of money.

The scope of the book was evidently intended by the author to be strictly that indicated by its title. He shows in 258 consecutively numbered drawings the successive undertakings made by many men to improve the effectiveness of the steam locomotive. In the second chapter, "Early Attempts at Locomotive Construction," 14 drawings are shown. In the third chapter, "Development of Locomotives in Great Britain," there are 13 drawings. In the remaining chapters there are 231 consecutively numbered drawings of designs by American engineers. It would seem, therefore, that the work done in Great Britain has not attracted the author's attention unduly; being Scotch, he has become a very enthusiastic American. Nevertheless, taken as a whole, and without regard to nationality, we have in this book easily the best picture that has ever been given of the progress in designing and also the mistakes and the way they were discovered, the results of trial in service. This has naturally led the author to give many charming paragraphs and chapters to early railroad history. For example, whole chapters are devoted not only to the development of the locomotive, but to the development of the lines of the Baltimore & Ohio, the Erie, work done on the Pennsylvania Railroad and on the Reading, as well as the New England and the western roads; also on the Lackawanna and the Lehigh Valley roads—and all these chapters are interesting and have a value.

The portraits and personal sketches of the great locomotive builders and of the many locomotive superintendents and master mechanics who have been concerned in improving the machine form not the least attractive feature. These sketches are lovingly done. The author is a man of warm heart as well as of strong prejudices. These personal sketches are not grouped by themselves; they are distributed throughout the book wherever, apparently, the author has happened to think of them, and it is evidently due to this association of ideas that he reserved for insertion in the last chapter, entitled, "The Locomotive of To-day," an excellent portrait and sketch of Samuel M. Vauclain, Superintendent of the Baldwin Locomotive Works. The concluding tribute is somewhat glowing but it is so nearly correct that it is worth reproducing:

"As General Superintendent over these immense works, Mr. Vauclain has the power of a monarch and it is wielded with a spirit of giving a square deal to the humblest and highest under his charge. Under his broad, kindly management harmony prevails and contentment takes the place of the antagonisms so common in great industrial establishments."

Laying-Out for Boiler Makers. New York: The Boiler Maker. 191 pages; 10 in. by 13 in.; 425 illustrations. Cloth.

The book is something more than its title indicates, for not only does it contain rules and directions for the actual laying out of sheets and the spacing of rivets, but also rules for the calculation of the stresses of the plates and the methods of strengthening them. In a work of this character especial emphasis is put upon the method of doing the work so that an intelligent workman might follow the instructions blindly without any idea of why he was doing it, and get fairly good results. This neglects all discussion of the principles involved, which are matters for consideration when the theoretical aspects of the case only are considered. In one or two instances these fundamental principles are discussed, as in the case of the determination of the shape of a sheet by triangulation, and the statement is distinctly made elsewhere that for the attainment of the highest degree of skill the whole subject should be mastered from a theoretical standpoint.

The book then is essentially devoted to the solution of specific problems, such as the laying out of elbows, tubular, locomotive and Scotch boilers; the repairing of locomotive and other types of boilers; the laying out of steel stacks and miscellaneous problems. The chapter on repairs is especially rich in suggestiveness and while it does not pretend to cover the whole range of what may be needed on the locomotive boiler it does cover a wide range of work for the firebox, such as the renewal of sheets, patching, replacing stays and the like. Then, throughout, the other chapters there are interspersed methods of calculating stresses and of proportioning the metal to sustain them, that will be of value not only to the man charged with the mechanical work of laying out but to the designer upon whom rests the responsibility for the safety of the structure.

Switches and Turnouts. By Howard C. Ives, Assistant Professor of Railroad Engineering, Worcester Polytechnic Institute. Pamphlet. 6 in. x 8½ in.; 28 pp. 50 cents.

In the three chapters which compose this pamphlet, Professor Ives has succeeded in making clear to his students the method of deriving formulae for different kinds of leads, both where the main track is straight and where it is curved. In the last chapter the mathe-

matics involved in the design of the double step switch crossing seems to be an original undertaking and it is well done.

CONTRIBUTIONS

Freight Claim Obstruction.

Pittsburg, Pa., Sept. 30, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have been much interested in Colonel Prout's address dealing with obstructions in the claim department, printed in your issue of July 19, and in your editorial on the settlement of freight claims, printed Aug. 9. I think the accompanying record of transactions with a railroad which I will call the A. B. & C. should be placed before your readers. Nothing in this record has been altered for publication except the name of the railroad and the names of places and persons.

Bill sent to the A. B. & C., March 14, 1902, for \$17.51, covering overcharges on eight shipments from Athens to Sparta, via X. Y. Company and A. B. & C. Railroad. Acknowledgment was made by the General Freight Agent of the A. B. & C. that this claim was valid and a proper claim. Three other claims for overcharge on the same class of goods shipped several months previous were paid promptly. Much correspondence regarding this bill was had during the succeeding year, and we were advised in May, 1903, that all the papers in the case had been lost and duplicate papers were requested. This request came from the Freight Claim Agent of the X. Y. Company. Duplicates were promptly forwarded as requested on May 11, 1903. Continued to keep after this matter from time to time and finally on May 11, 1907, I wrote a personal letter to R. B. Ely, president of the A. B. & C. We very promptly got a letter from the Third Vice-President, H. T. Evans, making apologies, and assuring us that it was their desire to pay claims promptly and that the matter would be attended to energetically and pushed to a final adjustment. We received several calls from a very affable gentleman, representing the A. B. & C. Finally this gentleman advised us that all these papers had again been lost, and asked for a triplicate set, which we furnished in June, 1907. And, in spite of many letters since that date we have received nothing further from them.

This certainly looks like a deliberate attempt to avoid payment by worrying claimants, and as if one of the railroads at least had a professional loser.

MANUFACTURER.

Seth Wilmarth and His Locomotives.

Boston, Mass., Oct. 1, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In reading the article by Mr. Caruthers in your issue of Sept. 27, "Seth Wilmarth Locomotives," it occurs to me that I may supply some features of Mr. Wilmarth's career that Mr. Caruthers was not able to find. At the time these engines were built I was a clerk in the office of the South Boston Iron Company, whose plant was adjoining to that of Mr. Wilmarth, and I was well acquainted with Mr. Wilmarth. His business originally was a general machine shop, until he took up the building of locomotives, and up to this time his business was successful and prosperous; but after a few years he made a contract with the Erie Railroad which brought him to bankruptcy, and his plant and business were sold out. I do not remember about his career after his bankruptcy, but have an impression that he was appointed to some superintendence at the Boston Navy Yard. I understand Mr. Wilmarth made a contract with the Erie Railroad for some 25 or 30 locomotives, which was a very large undertaking at that time, especially for a man of Mr. Wilmarth's limited means, and who was (as was generally the case with industrial manufacturers at that time) obliged to buy his supplies on credit. When he had fairly launched in the manufacture of these locomotives he found that the Erie Railroad could not pay cash, and he was obliged to take notes in payment, and when these notes became due he was obliged to renew them. This situation destroyed Mr. Wilmarth's credit, and he was obliged to realize on his notes as best he could. I understand that for a while he sold these notes to Daniel Drew, who was a banker as well as trustee of the Erie Railroad, at a discount, but this management was short-lived, and he was forced into bankruptcy. Another of the original locomotive builders within a stone's throw of the Wilmarth plant was John Souther, who associated with O. N. Pickering, organized the "Globe Works." I understand that Mr. Souther (who is now living in Boston, 90 years old) designed and made the patterns for the first locomotive which was used on the Old Colony Railroad, and which was named the "Souther." The Globe Works built many engines, covering several years of successful business, up to the time of the Civil War, when they turned their attention more particularly to work for the United States Government.

WM. F. HUNT,

President, Hunt-Spiller Manf'g. Corporation.

Control by State Commissions.*

BY ALEXANDER C. HUMPHREYS.

As I understand, we are gathered here to-night by reason of the belief that is happily taking root that there should exist a better understanding between those responsible for the management of public utility corporations and those to whom, in a degree not as yet finally determined, is entrusted the limiting control of these corporations.

It cannot be denied by any one who is competent in the premises and at the same time is fair minded enough to give expression to his honest opinion, that there has been in this country, during the last few years, a tendency on the part of the public, a tendency cultivated by the yellow press and temporarily adopted as a vote-winner by the politicians, to treat all public service corporations as enemies of the public and, hence, as unworthy of consideration. Unquestionably, in not a few cases this tendency has led to injustice being done to corporations which have been ably and honestly administered in the interest of the public as well as that of the proprietors.

Investigations have been held under state and federal authority which have not been honest investigations even as to intent but have been more nearly of the character of star chamber inquisitions; and this in spite of the ready boast of patriotic Americans that this is a country of liberty and fair play.

Public service corporations have been between two fires. On one side the reformers, some of them of the professional type, making reform their vocation, and others amateurs, zealous, generally honest, usually only partially informed on the subject they attempt to direct in, and bumptious in proportion to their ignorance; on the other side, the greedy professional politicians ready either to "strike" the companies or to serve temporarily as allies to the reformers in the hope of rehabilitating their damaged reputations, as for the moment seemed to point more directly to their final material advantage.

It would be laughable, if it were not so disquieting, to observe the zealous, honest, impressionable, hasty, and, hence ignorant reformer so often pulling the chestnuts out of the fire for the mercenary politicians—the men who are in politics for what there is in it.

I am not here to speak against reform, that is, true reform. There has been need of reform in connection with the matters to-night under discussion; and let us not forget that there has always been such need and there always will be. And let us hope there always will be those ready to fight for reform. Also let us not forget as freedom-loving Americans that no lasting great reform can come from injustice, no matter to whom or what applied. Therefore, in welcoming this pressure for reform, we need be all the more insistent that justice should be meted to all. In spite of the mistakes made through the ill-directed zeal of many of the amateur reformers, we may still find comfort in the reflection that their work and the ready response made by the masses to their appeals indicate that the people at large hunger for better things. Abroad we are credited, or rather debited, with being materialists. But our professional politicians have long since learned that, as a nation, we are idealists and can be influenced, sometimes improperly, by appeals to our moral sense.

The working man has been incited by the yellow journals to believe that capital, as represented in corporations, is necessarily inimical to their interests. I fear that labor is likely to learn, during the next six months or a year at the most, that capital cannot be injured without the ill effects being transmitted to labor. It remains for labor to learn—and possibly for capital to learn—that the two interests must be bound together, no matter what each interest may do to weaken the bond.

Unquestionably much good has been done by the reformers now so active; unquestionably also much harm—unnecessary harm—has been done in the securing of this good.

Apparently the cue has been taken from the head of the government in Washington. With his striking personality, his tremendous force, his restless and almost resistless energy, his enormous capacity for work, his ability to impress his auditors with the belief that his intentions are honest, his supreme self-confidence, his probably honest belief that many of the industrial corporations of the country were conducting their business outside of the law and, with it all and through it all, his unparalleled ability as a politician, President Roosevelt has been able to make a record against the power of capital which is not matched, as far as I know, in the history of the world. The odds at first seemed to be overwhelmingly against him but he has persevered against the odds and has, for the time, won out. The public loves a fighter, especially one who fights against odds. Roosevelt by his audacity has won the applause and votes of the people and apparently still retains their confidence.

*From an address on the "Control of Gas Companies by State Commissions," read at Madison Square Garden, New York, Oct. 1, by Alexander C. Humphreys, President of the Stevens Institute of Technology.

Thus the President has done an immense amount of good, and in the doing he has done an immense amount of harm. It must be the task of history to strike the balance and show whether it rests upon the side of harm or good.

We are all suffering at present from these reform measures so indiscriminately applied. When I say "we" I do not mean those of us who are interested in public service corporations but I mean the people of the United States at large. It will not be long, I fear, before no argument will be required to show that the smashing of values which has characterized the recent march of events has injured the country as a whole. It will be demonstrated that the prosperity of the country—material prosperity—depends upon public confidence, and that the west and other parts of the country are mistaken in their claims that they are now strong enough to demonstrate that they are not dependent upon "Wall Street" for financial support. Call the money center what you will, it will never be found that trade can proceed along normal lines while those who are in control at the world's money centers are in doubt as to the future protection to be afforded to capital.

We are now having forced upon us—and we are likely to have it still more strongly forced upon our attention—that sentiment in material things, while possibly intangible and hard to exactly appraise, is very real as to its influence. All of this should need no argument when we reflect upon the fact that only a very small percentage of the business of the world is done upon anything else than credit. And what in the last analysis is credit but confidence in our fellowmen? It is only the belief in the unparalleled material resources of this country generally held by the capitalists at home and abroad which has so far prevented a ruinous commercial panic born of fear as to the effect of the reckless "reform" legislation in which so many states have competed for first place, and the radical innovations which the National Executive has instituted for the control of corporations. And while a panic has thus, for the time at least, been averted, properties have been tremendously depreciated and innocent investors have been injured.

The situation was in part well covered in an address recently delivered at a western college: "The greedy politicians call for expenditures while refusing to let the railroad earn the money to pay for them."

I have stated that some of the investigations which have been held have been conducted unfairly, not in the hope of bringing out the whole truth but in the hope of proving the corporation under fire to be in the wrong. In a paper read last spring before the New England Association of Gas Engineers, in which I endeavored to point out the necessity for the adoption and maintenance on the part of the gas men of America of a uniform system of accounts and records, I gave some cases which have come under my personal observation. I also drew attention to a case reported to me by a friend. A few days before the conversation with me, he had a talk with a prominent judge and they had discussed the results to be expected from an investigation of the character to which I am now referring and which had been carried by appeal into the courts. The judge asked my friend his opinion as to the outcome; my friend being well informed as to the character of the evidence on both sides expressed the opinion that the outcome must, of necessity, be favorable to the corporation under fire. The judge then expressed the opinion that the courts, in spite of the evidence, would not dare to decide in favor of the companies *because public opinion would thus be outraged*. And this was the opinion expressed by a judge generally held in respect. If this was the case a year or more ago, let us hope, for the sake of our country's good, that it is not so to-day.

There are some indications that the tide has commenced to turn and, if these indications are verified, we may well expect to find the politicians changing their tune and preparing to desert reform and return to other practices which, in the past, have put the public service corporations on the defensive and, in some cases, have appeared to force these companies into courses which the politicians now find it to their advantage to condemn. Thus the corporations having been delivered from the fire by the offered refuge of the frying pan, are again threatened with the fire—an uncomfortable position at the best.

Let us hope that the opinion expressed in a recent editorial in one of our New York evening papers has a real foundation in fact, viz.:

"Signs multiply that the fury of destructive legislation has almost run its course."

At least it appears to be true that it does not to-day require as much courage for a public servant, judge or member of a commission, to follow his conscience as opposed to public sentiment and clamor as it would have been, say, a year ago.

In the address just referred to, the speaker—a man of wide experience in the subject treated—traced the history of the development of government in the United States, and showed how the democratic idea had been steadily abandoned in the search for efficiency and also showed the dangers to be apprehended from this

seeking after increased efficiency of control. Let me quote a single paragraph:

"As a result perhaps three-fourths of the relations which the people hold to corporations, municipal and business, are now in the hands of the commissions and bureaus. In the majority of cases, the work is done by incompetent or inexperienced men, and is, therefore, badly done. There is continual interference with the freedom of internal trade and commerce of which we have always boasted ourselves; while the executive, instead of being weakened, has been strengthened by exercise of the power of appointment and removal. But the most illuminating feature of these intervening bodies is that they have been fashioned for the avowed purpose of avoiding or averting the popular control; a tendency which has commanded general acceptance. Their history illustrates the trend towards a central power, verging upon the absolute, retiring so-called democratic government further into the background and promoting the growth of that bureaucracy continually held up to reproach when dealing with the systems of other countries."

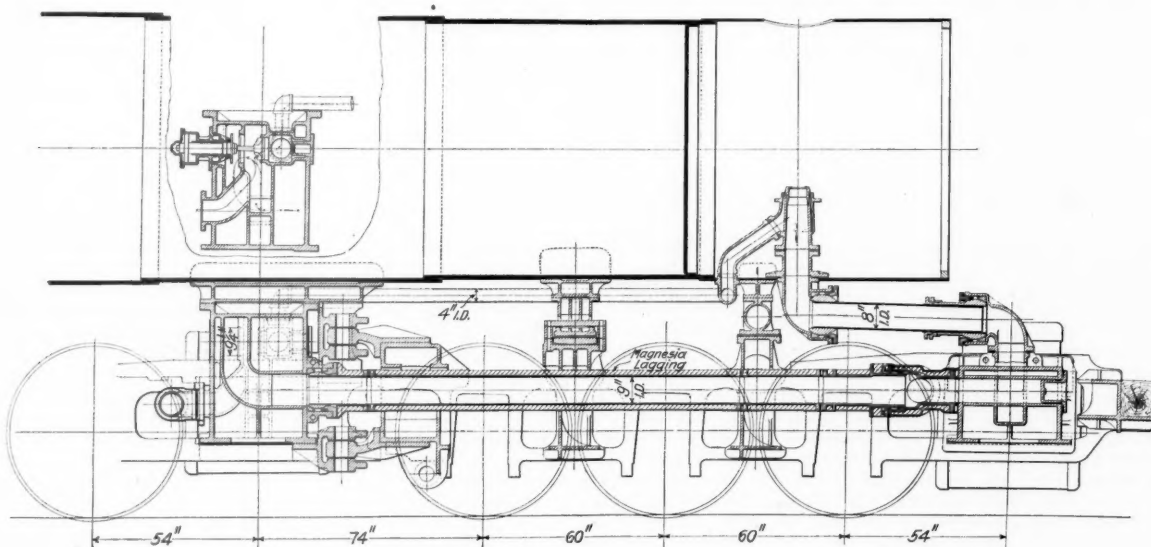
The dangers pointed out by this speaker are very real, and, as a self-governing people, we may well regard with apprehension the present tendencies.

But to-night we are called upon to consider the conditions as they exist and we must recognize that, apparently, the gas companies of the state of New York for some time at least must be prepared to accept a certain measure of control at the hands of one or two state commissions. Our experience with legislative control had not been encouraging and so many of us were led to believe that the men in control should be limited in number and selected

prejudice to our companies' rights, it remains for us to do our utmost to assist them in the fair performance of their duties. We must be frank and fair in the presentation of our data, and we must be all the more careful when we come before them in any specific case. Having exhausted every possible means to prevent our cases before the commission in accordance with the facts as we understand them, if we fail to obtain what, after full consideration, we believe is justice, then it finally remains for us, as trustees for our bondholders and stockholders, to appeal to the courts for protection and to carry the appeal, as high as it can be lodged. In other words, we must resolve to be absolutely fair ourselves, and, having so resolved and having lived up to the resolve, we must not flinch from the test if we have to fight to the limit for our rights.

Details of Mallet Articulated Compound Locomotive.

A general description of the articulated Mallet compound locomotive that has recently been built for the Erie Railroad by the American Locomotive Company was published in the *Railroad Gazette* of August 16. Allusion was there made to a number of special features which will now be taken up and illustrated in detail. In an engine of this character one of the difficulties that will appeal to the designer will be that of conveying the steam from the throttle to the exhaust of the low-pressure cylinders without leaks or joints that are liable to leak and yet compensate for the varying relative positions of boiler and cylinders. Here there are three movable parts changing their relative positions not only in angu-



Steam Piping Mallet Articulated Compound Locomotive; B. & O. Railroad.

for the work in hand. Unquestionably, it is better to be subject to the control of a limited number of honest and capable men, who can, from time to time, add to their knowledge of our business and so be better prepared to render a fair judgment on problems more or less intricate, problems which it has taken some of us a lifetime to solve. But it finally resolves itself into the question of personnel. I think we have reason to believe that the public service corporations of the state of New York can congratulate themselves not only that the old commission has been legislated out of office but also on the personnel of the new commissions. We cannot expect these men at once to know everything about our business, but we can expect that they shall inform themselves as rapidly as possible, and we can expect and demand that they shall render a fair decision in every case based upon their understanding of the evidence. To Fourth-of-July Americans it should be unnecessary to make such a point, but unfortunately it is too often the enthusiastic spread-eagle type of American who needs this kind of reminder the most. Enthusiasm is a grand thing and a people without enthusiasm is started on the road to decay; but enthusiasm uncontrolled by common sense and a dominating spirit of justice is an ever present danger.

Unquestionably the evidence has not controlled in many of the cases which have been carried before the governmental commissions during the last year or two; and, to be more specific, unquestionably the evidence did not control in the cases taken before the old Commission of Gas and Electricity of the state of New York.

But the question of correct judgment cannot rest entirely with the commissions. Having satisfied ourselves how far we can go in acknowledging the jurisdiction of the commission without legal

clarity but in linear distances, and the steam must flow through the three sides of the varying triangle that they may be considered to represent, starting from one as its source and returning to the same for the exhaust.

Up to the point where the steam is discharged from the high pressure cylinders there is no essential change from conditions obtaining on ordinary locomotives. The special throttle is placed in the dome with a dry-pipe leading forward. This dry-pipe, however, instead of extending on to the front tube-sheet, stops short at 62½ in. in front of the dome and turns up through the shell to a tee upon the outside, from which the steam pipes are led down on either side to the tops of the steam chests of the high-pressure cylinders. This is all shown very clearly by the engravings on pages 171 and 172 of the issue of Aug. 16, where there is also a general description of the steam connections. It is, however, as the steam leaves the high-pressure cylinders that the real interest in the steam passages begins.

It will be remembered that, in the general description of the locomotive, it was shown that the two high-pressure cylinders were not joined on the center line of the boiler but that the half saddle of the one on the left-hand side extended 8½ in. over to the right in order that it might contain the intercepting valve and have the outlet to the receiver in the axis of the engine. By referring to the engravings of the high-pressure cylinders on page 172, it will be seen that the exhaust passage of the one at the right leads back to an 8-in. opening in the rear of the half saddle, and that there is a similar opening in the left-hand cylinder casting to the large exhaust passage leading up to the intercepting valve chamber 9¼ in. in diameter near the top of the saddle. These two openings are

connected at the rear of the saddles by a cast-iron return bend, with a clear circular opening 8 in. in diameter and spaced $23\frac{1}{2}$ in. from center to center. It is held to each half saddle by four 1-in. bolts, and the joints are made tight by the ordinary ground cast-iron rings with ball joints in the main casting turned on 6 in. radii and with flat faces on the return bend. As there is no motion here the whole passage is rigid.

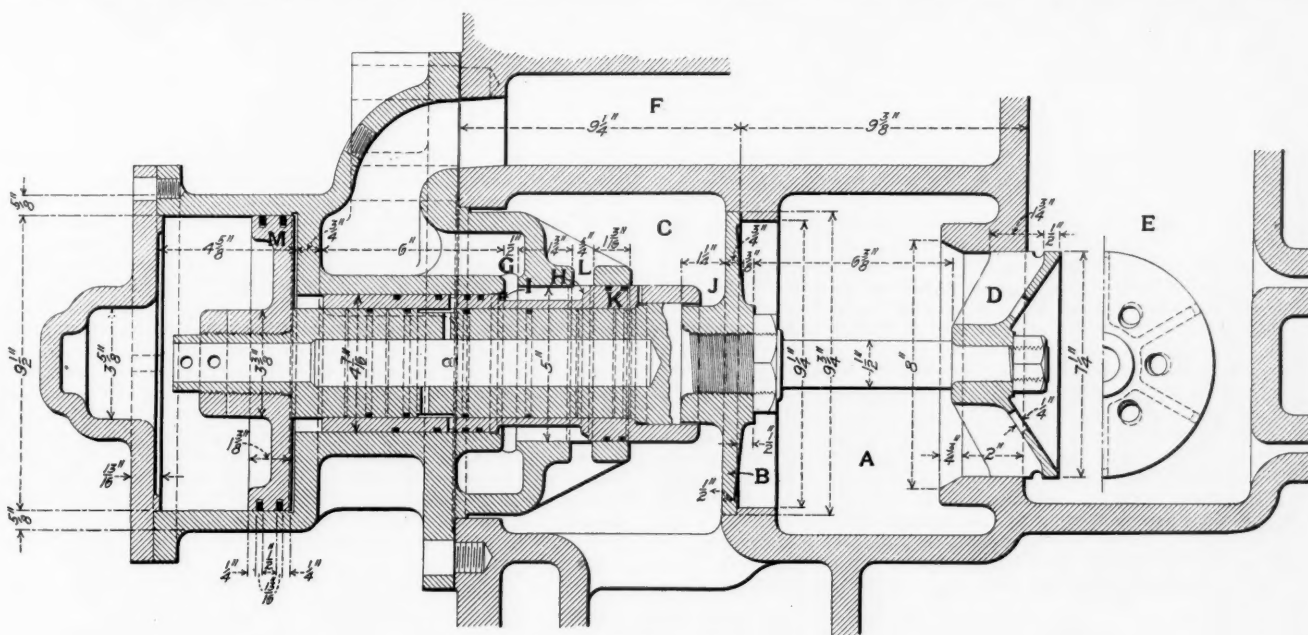
The steam from both sides is thus discharged into the exhaust passage of the left-hand cylinder and then rises to the intercepting valve. This is of the Mellin type, first used and developed in the two-cylinder compounds built by the Richmond Locomotive Works, but differs from that valve in some of the details of its mechanism and in its location on the engine. In the Richmond two-cylinder compound locomotive, the high-pressure exhaust was delivered direct into the smokebox receiver pipe passing in an arch from one side of the cylinder to the other, and the intercepting valve was placed in the low-pressure side. That is to say, the intercepting valve was placed between the receiver and the low-pressure steam chest. In operation live steam was automatically admitted at a reduced pressure to the low-pressure cylinder until the high-pressure exhaust had banked up sufficient pressure in the receiver to open the intercepting valve; when that event occurred, and the flow of direct steam to the low-pressure cylinder was cut off, the receiver steam admitted and the engine thrown into compound action.

In the Mallet compound the order of events is the same but the arrangement of parts is different. Instead of placing the intercepting valve at the low-pressure end of the receiver pipe it is

allowed to pass forward through the small pipe shown in the engraving of the steam pipes, to the main exhaust, the details of which will be considered later.

When this emergency exhaust valve is open there is no tendency to raise the pressure beneath the main valve B of the intercepting valve, and the whole locomotive works in single expansion. If, on the other hand, steam is not admitted to hold the emergency exhaust valve open, the spring closes it and holds it there, which it is arranged to do because the valve is partially balanced by the pressure against the face of the piston, and the unbalanced force tending to open it is only that represented by a ring $\frac{1}{8}$ in. wide and $5\frac{1}{2}$ in. outside diameter, the difference between the exposed areas of the valve and the piston.

With the emergency valve closed and the intercepting valve in its normally closed position which is that existing at starting, the sequence of events at that time is as follows: When the throttle is opened, live steam is admitted to the passage F outside the valve case and passes down through the port G and, filling the grooved opening in the reducing valve K, presses with equal intensity against the shoulders H and I. As the area of the shoulder H is the larger of the two, because of its larger outside diameter, the valve K, which is merely a sleeve fitted with packing rings for its bearing surfaces,* is moved to the right and the live steam flows freely into the chamber C. As the pressure rises in this chamber, it acts upon the whole of the end of the sleeve K, and as this end area combined with that of the shoulder I is greater than that of the shoulder H, it follows that before the pressure in C has risen to the full



Intercepting Valve.

placed, as already stated, in the saddle of one of the high-pressure cylinders and receives the exhaust direct from both of those cylinders. This exhaust steam enters the space A beneath the main valve B, which is held normally closed by the reduced pressure live steam admitted back of it into the space C. Attached to the stem of the main valve and moving with it is the wing piston D. This latter part serves to guide the stem of main valve, and, through the holes in its face and the opening about its rim, permits the high-pressure exhaust to pass on to the passage E, whence it has direct access to the emergency exhaust valve.

In the original Richmond compound the emergency exhaust was in a line and concentric with the axis of the main valve. In this modification for the Mallet compound it is a separate mechanism. By referring to the horizontal section of the left-hand cylinder on page 172, it will be seen that there is an opening on the outside face of the saddle that connects directly with the intercepting valve chamber. The flange (1) of the emergency exhaust casing is bolted to the side of the saddle so that its opening is put in communication with the chamber (2), which is closed by the wing valve (3) held normally against its seat by the spring acting on its stem and located outside the casing. Also attached to the stem of this valve is the piston (4) that is fitted with spring rings and moves in the short cylinder bored in the casing to receive it. When it is desired to work the engine in single expansion for all four of the cylinders, a cock is opened in the cab and live steam admitted through the opening (5) to the space back of the piston, moving the latter ahead, and opening the valve (3) through which the exhaust is

boiler pressure exerted on H, there will be enough of an effort exerted on J to push the sleeve toward the left and thus close the opening made by the passage of the shoulder H past the port L. The ratios of these areas are so adjusted that, when the pressure in the chamber C has risen to the point at which it is desired that the initial pressure in the low-pressure cylinders should stand, the sleeve will close the port L.

Steam admitted to the chamber C has free access to the receiver and the low-pressure steam chests; so that as soon as the throttle is opened steam is admitted to all four of the cylinders and the normal tractive effort is exerted.

Then the first exhaust of the high-pressure cylinders passes into the space A and fills the passage E and the chamber (2) of the emergency exhaust valve, and when the pressure in these cavities has risen to a point slightly above that existing in the chamber C, the main intercepting valve B is opened by being moved to the left and the high-pressure exhaust is thus given a clear passage to the receiver and the steam chests of the low-pressure cylinders.

As the main valve B is moved to the left it strikes the end of the sleeve K and, carrying it with it, closes the port L and thus prevents the admission of any more live steam to the chamber C and the receiver, and the engine enters upon its compound working. But if, at any time, the additional tractive power that can be obtained in single expansion action is desired, the opening of the emergency exhaust valve from the cab will bring that condition about.

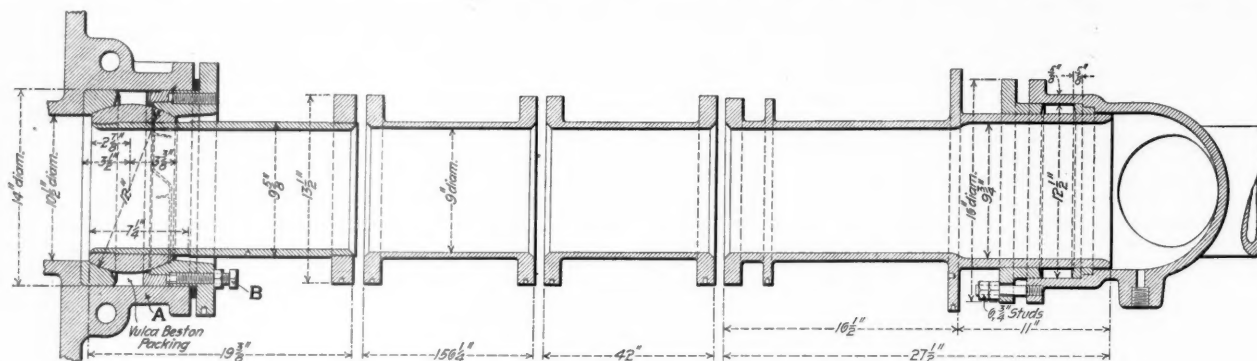
At the rear the stem of the main valve is fitted with a piston

M that moves in a cylinder forming a dashpot and thus preventing any approach to slamming. The surface where the stem is in contact with the inside of the sleeve is fitted with packing rings sprung into place so that leakage of steam is prevented.

When the steam leaves the chamber C of the intercepting valve, it passes out through a passage cored in the saddle to the receiver pipe. As will be seen by referring to the assembled engraving of the steam pipes the passage from the intercepting valve drops down and curves to the front for the receiver pipe connection. Up to this point there has been no necessity for any flexibility in the joints as all parts have been attached to and move in unison with the boiler. With the connection of the receiver pipe this is changed, for not only must there be a possibility of an angular displacement due to the relative positions of the two trucks, but there must be

and the joint between the two parts is made tight with the usual ground ball joint.

The steam passes through the low-pressure cylinders, doing its work in the usual way and issues from the top through exhaust openings set near the center line of the engine and spaced $7\frac{1}{2}$ in. apart from center to center on the two saddles. An exhaust pipe elbow is bolted on to cover both openings and to turn the exhaust back towards the smokebox. This elbow is fitted not only with a universal ball joint by which the exhaust pipe is enabled to swing and keep in line with the corresponding elbow on the smokebox, but also contains a stuffing box and slip joint by which the variations in distance between the centers of the two elbows are taken care of. At the rear the exhaust pipe terminates in another universal ball joint set in the smokebox elbow, so that the exhaust



Receiver Pipe.

an extension due to the motion that must exist between the frames. The detail of the receiver pipe shows how these requirements are met.

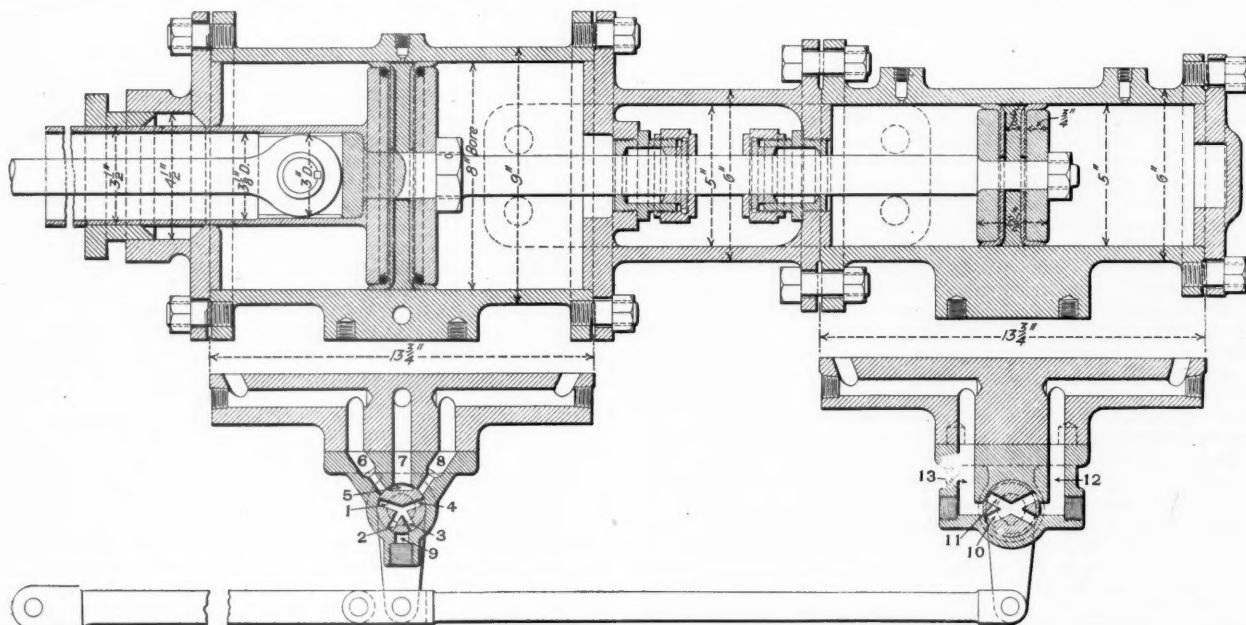
There is an extension A on the front of the high-pressure saddle that is bored out to receive two glands turned to a spherical inside fit and which can be adjusted against the ball-bearing on the pipe by the studs B, so that lost motion occasioned by wear can be taken up and leakage of steam prevented. This is the only flexible joint in the receiver pipe, and is the only one that is necessary because the center line of the pins coupling the two frames nearly coincides with the center of the ball joint, so that the whole of the front truck, with its cylinders, swings around this point and the angular displacement is nearly the same.

The receiver pipe is made in three sections merely for convenience in erecting, and at the front end it passes through an ordinary stuffing box in a tee, in which it has a fore and aft motion by which the variations in length can be made. The joints between the sections are made tight by the insertion of cast rings of V section turned to fit the recesses shown in the ends of the pipe. The tee at the front is a simple iron casting with branches to mate with the admission openings in the back of the low-pressure saddles,

pipe can adjust itself to any and all variations in the relative positions and alinement of the low-pressure cylinders and the smokebox.

The hole above the smokebox elbow is $16\frac{1}{2}$ in. ahead of the center of the stack, so that the interior exhaust pipe is given an offset of that amount in order to bring it in line. In addition to this it has the added peculiarity of an attachment for the emergency exhaust. This exhaust pipe is led forward from the outlet of the emergency exhaust valve to a point just ahead of the front tube-sheet. Here it turns in to the axis of the boiler and thence through another elbow enters the smokebox and connects with the auxiliary exhaust pipe back of the main one. The main casting is made with a flange and short connecting pipe leading to an annular space like a steam jacket about the exhaust passage from the low-pressure cylinders. The exit from this annular space is through a contracted annular nozzle about the main one. With this arrangement there is no interference with the integrity of the low-pressure exhaust at any time, either when starting or when running the engine in single expansion. As the emergency exhaust pipe is connected rigidly to the boiler or parts moving with it at each end there are no flexible joints required in it.

Closely allied to the required flexibility of the steam piping



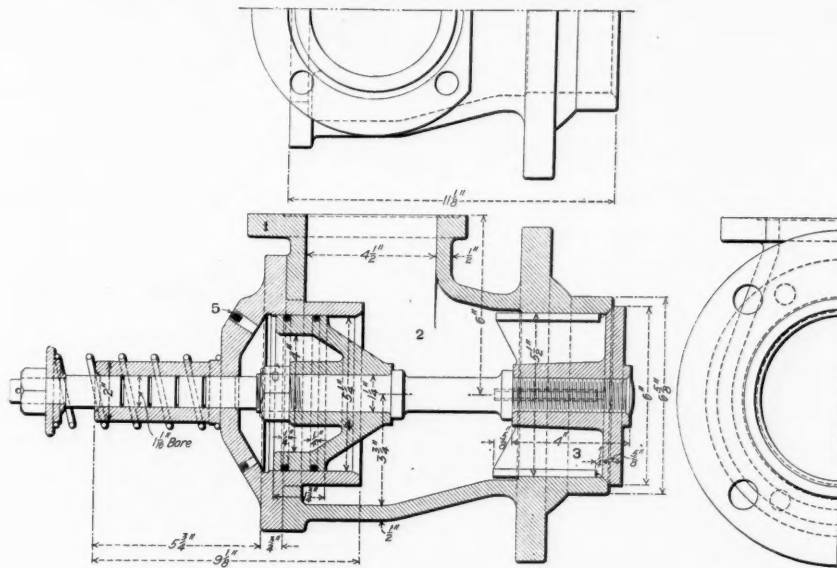
Valve Arrangement for Power Reversing Gear.

are the connections between the frames and the boiler. The boiler is necessarily supported by both front and rear frames, but it is rigidly attached to the rear one only, sliding supports being provided for the front. The connection between the two frames is by means of pivot pins and is of such a character that the whole tractive effort of the forward cylinders is transmitted to the rear frame through this connection and thence back to the drawbar connecting the tender.

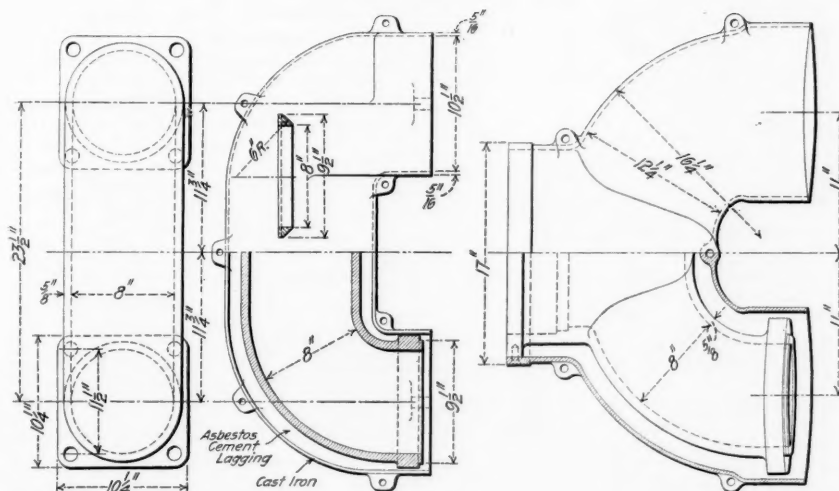
The general arrangement of the connection between the two frames is clearly shown by the assembled engraving of the steam pipes, which is that of the Baltimore & Ohio engine but is the same as that of the Erie. At the rear end of the forward frame heavy cross-tie castings are attached to both the top and bottom rails, and these in turn carry the male sections of a pivotal connection,

of the front end of the boiler. The second is intended to serve merely as a guide and centering device to bring the boiler back central with the front frame when it runs out of a curve. It is provided with bearing surfaces but it is expected that the lifting springs with which it is provided will relieve these surfaces of all load.

The general arrangement of this centering device is shown in the engraving of the assembled parts. The casting A is attached to the boiler and has the spring case D bolted to its lower face. The lower face of this spring case is planed smooth and is fitted with a wearing surface provided with oil grooves, so as to move easily to and fro across the top face of the heavy frame cross-tie F that is bolted to the frames G G. The spring case contains two nests of helical springs provided with thimbles in whose sockets

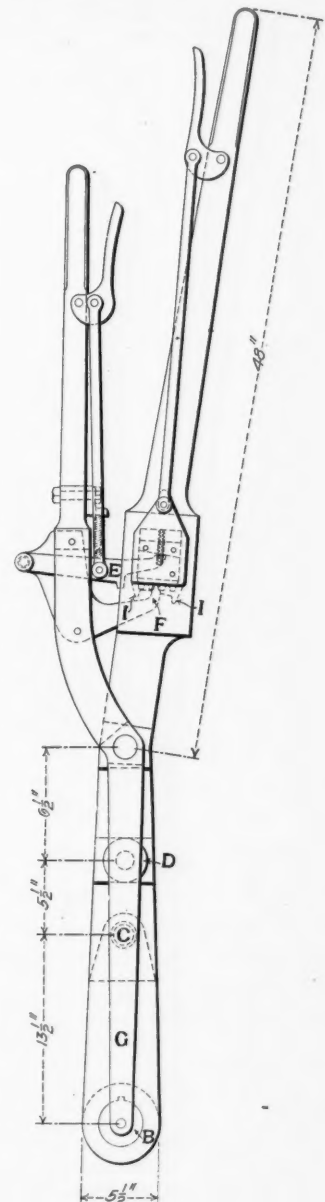


Emergency Exhaust Valve.



Exhaust Passage Connection; High Pressure Cylinder.

Dry Pipe Tee.



Reverse Lever.

the female being bolted across the front face of the saddle of high-pressure cylinder and attached to the frames. Two heavy pins complete the connection.

The boiler is fastened to the rear frame at the high-pressure saddle and at three points beneath the firebox, the one at the extreme back end taking the form of the usual buckle plate. This holds the boiler in line with the rear frames at all times and causes a large range of lateral displacement over the front truck; a displacement that increases toward the front end of the machine and at the cylinders is at the extreme, as illustrated by the half-tone engraving of the front on page 174. The boiler is therefore carried on two sliding supports by the front frame. Of these one is placed about midway between the high-pressure cylinders and the front tube-sheet which is intended to carry the whole of the load

the stems E E have a bearing. These stems are pivoted in the brackets D which are bolted to the cross-tie F. At the center the two springs have a bearing on the spring case B. It is evident that when the boiler swings to one side or the other of the center lines of the frame and carries the spring case with it, the spring at one end or the other is compressed and tends to push the case, and with it the boiler, back to the central position.

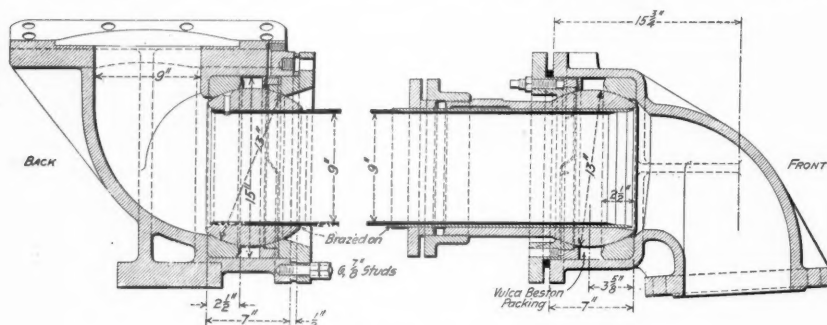
In order to relieve the bearing surfaces between the spring case and the frame cross-tie F of that part of the weight of the boiler that would naturally come upon it and, at the same time, render the centering action of the springs more effective, an upward thrust is exerted against the main casting A. Near the lower edge of this casting there are two hemispherical sockets in which the ends of the relief stems I I are fitted. The lower ends of these relief stems

rest in sockets attached to the swinging seats J. These seats are pivoted to a cross-tie H that rests upon the lower rails of the frame. They are held up against the lower ends of the relief stems I by U bolts K K, and these are, in turn, supported by springs which rest upon the cross-tie. These springs are put in position under a tension sufficient to sustain that portion of the weight of the boiler of which it is desired that the surfaces between B and F should be relieved. They also serve to compensate for any angularity that the relief stems may assume due to the lateral motion of the boiler.

By this arrangement the boiler is free to move to and fro across the supporting surfaces without exerting an undue frictional thrust upon the frames and without being raised above its normal position by the auxiliary supports. There is a support back of the centering device upon which the weight of the forward part of the boiler rests and to which attention has been called. This consists simply of castings fastened to the boiler shell and frames and fitted with suitable wearing surfaces that are properly lubricated and with stops so adjusted that the desired fore and aft movement due to the play between the two frames is allowed.

Owing to the fact that there are two sets of valve motions to be moved by the reverse lever an air-operated reversing gear is used. In the cab there is the usual reverse lever attached to the reach rod in the ordinary way and fitted with the regular latch engaging in the teeth of the quadrant. In addition to this the reverse lever is also coupled to the piston rod of the air gear. Back of the main reverse lever and pivoted upon it there is what looks like an auxiliary lever. This is used for the handling of the motion when air is worked. The engraving of the two levers show the relative proportions and their connection with each other. The main lever is pivoted to the reverse lever stand at B; is connected to the piston of the air cylinder at C and to the reach rod at D. It is fitted with the usual latch engaging in notches cut in the quadrant and is also provided with a special latch for locking and limiting the motion of the auxiliary lever.

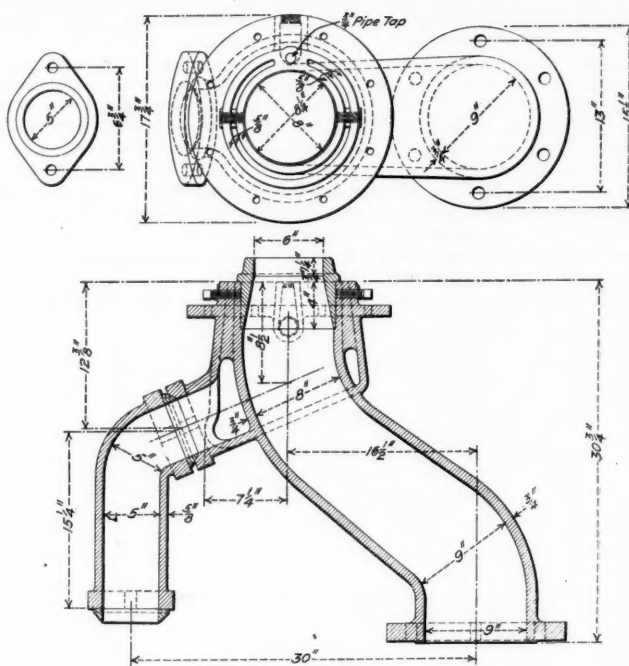
The auxiliary lever is pivoted on the main one at A, and when



Exhaust Pipe.

a change of cut-off is to be made the latch handle of the auxiliary lever is pressed in and this lifts the main latch by means of the lifting bar E. The lifting of the main latch also frees the auxiliary latch finger F and gives it a freedom of movement between the two lugs 1, 1. The movement of the auxiliary lever to or from the main lever by the distance permitted by the lugs 1, 1, swings the lower end G so that its center is out of line with that of the lower end of the reverse lever at B. As both levers turn about this point the offset thus obtained is practically constant and is utilized to operate the valves of the air and oil cylinders, as will be described later.

There are two cylinders set tandem for the reversing gear. Air is used as a motive power and it is worked in a double-acting cylinder of 8-in. bore. The other, or oil cylinder, is 5-in. diameter. Both pistons are packed with leather cup packing, that for the oil being held by the followers only, while that on the air piston is held out by a spring ring. Packing boxes for the rod are placed between the cylinders and for the trunk piston rod at the air end, where there is a short connecting rod leading to the reverse lever. In operation, whenever the auxiliary reverse lever is in its normal position, the valves of both oil and air cylinders are blanked. This locks the gear for, with the oil cylinder filled, no motion can take place when the by-pass is closed. The connections show the operation of the valve. The valves are simple tapered plug valves: that for the air has a four-way opening in addition to an exhaust cavity and that for oil has crossed passages so that the two ends of the cylinder are put in communication whenever the auxiliary reverse lever is pushed forward or back. For example, when the auxiliary lever is pushed forward the lower end of the arm G is drawn back turning the air cock so that the port 1 is opened to the passage 6; 3 is open to the air inlet 9 and the exhaust cavity 5 opens the passage 8 to the exhaust 7. Air is thus admitted to the rear of its cylinder and the motion is moved forward. At the



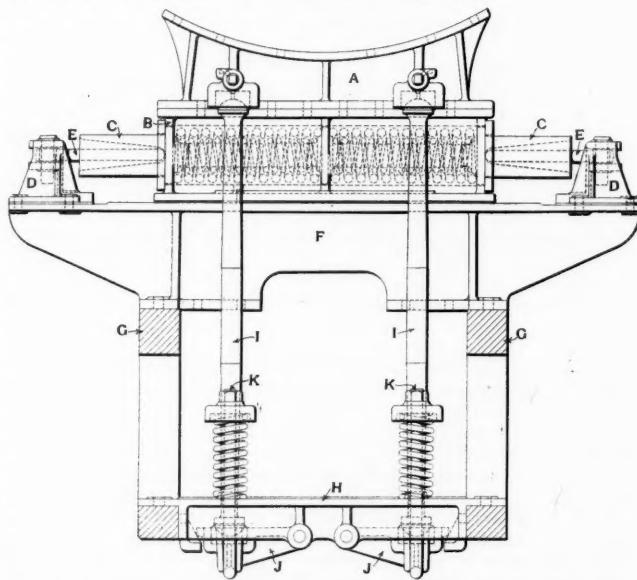
Exhaust Nozzle.

same time the cross passage 10 is turned to allow oil to pass from 12 to 13. For reversing, the air is admitted to the front passage 8 through the port 4 and the by-pass of the oil cylinder is opened by 10.

By giving the auxiliary lever a slight angular position the passage of oil from one end of the cylinder can be checked to any extent and the moving of the gear be made slowly or rapidly as may be desired. When the gear is to be moved the auxiliary lever must be kept in motion as long as it is desired that the gear shall move, and when the desired notch in the quadrant has been reached, the lever is brought to its normal position relatively to the main lever, the movement stops at once, the ports are covered and the pistons locked.

These are the principal items of interest connected with the locomotive in that they are the details that are essential to permit the proper relative position of the frames on curves. The great size of the machine made

it necessary to give close attention to every item of its construction in order that suitable proportions might be obtained, and as such each part of the engine is deserving of close study.



Centering Device for Front Frame Section; Mallet Articulated Compound Locomotive.

Turntable Deflection.*

In investigating a certain turntable it was desired to know whether it had an undue amount of deflection and to that end it was necessary to know the theoretical deflection. The writer was unable to find any ready method for determining deflection and worked out the following graphical solution. The problem was to find the deflection of the table at the guide rail when loaded with a locomotive weighing the same as the rated capacity of the table (in this case 150 tons) and set to balance the table as shown in Fig. 1. The principal dimensions of the table are also shown in this figure. For convenience in solving the problem only half of one end of the table was considered, hence we have to find the de-

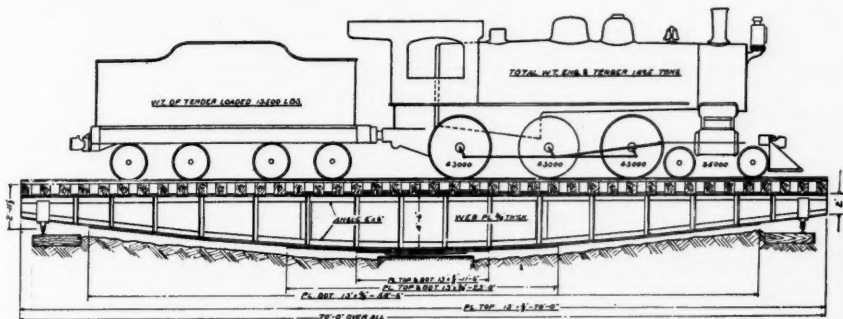


Fig. 1—Locomotive in Place on Turn Table.

flection of a cantilever beam with several concentrated loads and a varying moment of inertia, the loads being half the weights on drivers and truck. This is shown at the top of Fig. 2. For a rigid analysis both ends of the beam should be considered, due to the different moments obtained from the tender loading, but this is but a repetition of the work shown.

Briefly, the process consists in obtaining first, the moments of inertia at the various sections where changes occur, in this case at the beginning and end of each top and bottom plate; second, the moments taken about the center and under each wheel; third, obtaining the value of the moments divided by the moment of in-

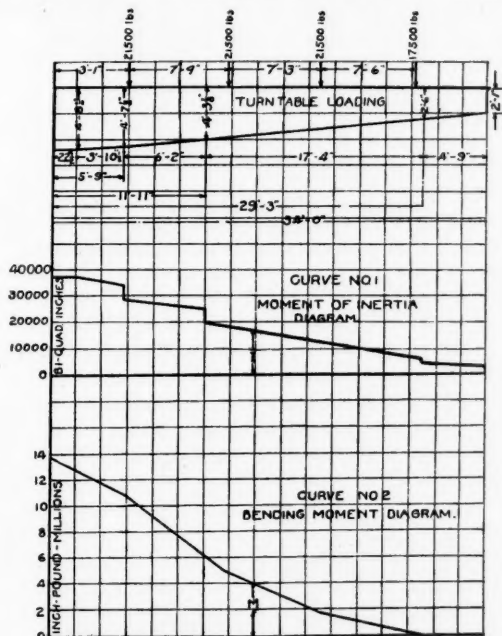


Fig. 2.

ertia; fourth, integrating this value, and fifth, again integrating to obtain a value from which the deflection may be obtained.

In the following:

M = bending moment in inch pounds.

I = moment of inertia in bi-quadratic inches.

E = modulus of elasticity in pounds per square inch.

d = deflection in inches.

C & C' = constants of integration.

Curve No. 1 shows the moments of inertia figured at the points indicated and laid down to a convenient scale. The I 's were figured by the well known formulæ for built-up sections (method shown in appendix).

Moments were next treated, the table being cut at the center and under each wheel, loads between section cut and end of table only being considered. This laid down to a convenient scale gave curve No. 2.

In the solution of the problem it is necessary to know the value of $\frac{M}{I}$ (see mathematical solution below), hence curve No. 3 shows graphically the result of dividing the M of curve No. 2 by the I of curve No. 1 and gives an $\frac{M}{I}$ curve from which values may be taken directly.

The next step calls for an integration of values already obtained. Curve No. 4 is a graphical result of such integration and is obtained from curve No. 3 by taking the number of squares under the curve to the right of any point and multiplying it by the value of one square in inches. In the example given one square had a horizontal or abscissae value of 24, while the vertical or ordinate value was 100, hence each square value was 2,400. On curve No. 4 each square was given an ordinate value of four squares of No. 3 or 9,600, the abscissae value remaining 24 as before.

Curve No. 5 is a graphical integration of No. 4, and is derived in the same manner as was No. 4, except that eight square spaces of No. 4 were used for one vertical space of No. 5. The units of $\frac{I}{M}$ diagram are lbs.

\div (inches)³. By integrating we have lbs. \div (inches)³ for the units of curve No. 4, while further integration gives lbs. \div inches. By taking the value of E at 29,000,000 lbs., and dividing the value obtained from the curve at any point by 29,000,000 we get the deflection at that point in inches—the desired

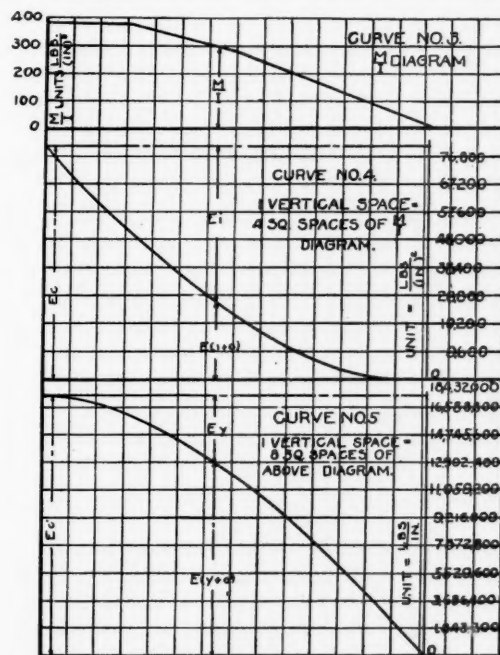


Fig. 3.

result. Mathematically this is shown by the following. (See Church's Mechanics, p. 310.)

The turntable is considered as a cantilever with several concentrated loads and varying I 's.

Since, from the moment diagram

$$EI \frac{d^2y}{dx^2} = M, \text{ then } EI \frac{(dy)}{dx} \frac{d}{dx} M dx$$

Integrating,

$$EI \frac{dy}{dx} + c = \int M dx, \text{ where } c = \text{constant of integration.}$$

$$\therefore \int M dx = EI (y + c), \text{ where } y = \frac{dy}{dx}$$

$$\text{hence } M dx - EI c = EI y, \text{ but}$$

$$EI y = EI \frac{dy}{dx} \therefore EI y dx = EI dy, \text{ integrating}$$

$$\int EI y dx = EI (y + c'), \text{ where } c' = \text{constant of integrations.}$$

Since the origin is at the right of the curve this reverses the signs,

*A. A. Kellogg, in *Purdue Engineering Review*.

The deflection at the center is zero.

This method of finding the deflection checked up in the case cited. The deflection by calculation was approximately 19.32 in., while the actual deflection, taken by an engineer's level, was $\frac{5}{8}$ in., when the table was loaded as shown.

Acknowledgment is due to a paper on "Car Bolster Stresses" by Prof. W. K. Hatt, of Purdue University. (*Railroad Gazette*, Dec. 23, 1898.)

APPENDIX.

Method of Obtaining I of Section.

I of web = $1.3 bh^3$ (Church's Mechanics, p. 94).

I of angles = $2 (I_g + F d^2)$, where,

I_g = moment of inertia about gravity axis, from handbook.

F = area of angle from handbook.

d = distance from center line to center line of gravity of angle.

I of top plate = $I_g' + F' d'^2$, where,

I_g' = moment of inertia of plate (if small, this may be neglected).

F' = area of plate.

d' = distance from center line to center line of gravity of plate.

Rivet holes to be deducted from I of section:

Through angles and web = $F'' d''^2$, where,

F'' = area of rivet hole.

d'' = distance from center line of section to center line of rivet hole.

Through top plate = $F''' d'''^2$ where,

F''' = 2 (area 1 rivet hole).

d''' = distance from center line of section to center line of hole.

Total I of entire section = $2 [(I \text{ of web} + I \text{ of angles} + I \text{ of top plate}) - (F d^2 \text{ of rivet holes.})]$

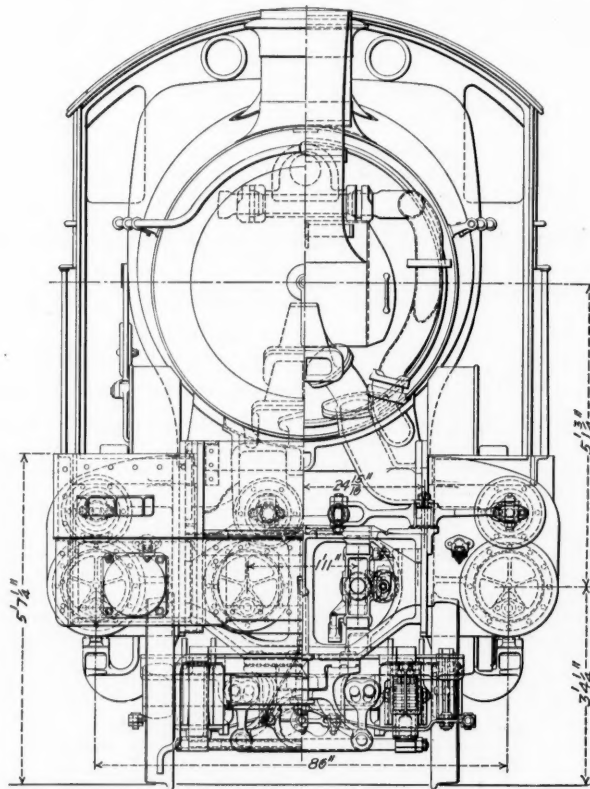
Four Cylinder Simple Express Locomotives; Great Western Railway.

Through the courtesy of Mr. G. Jackson Churchward, Chief Mechanical Engineer of the Great Western Railway of England, we illustrate and describe herewith the latest type of locomotive built at Swindon Works for hauling express passenger traffic on that line. The wheel arrangement is 4-6-0, and there are four single-expansion cylinders placed two inside and two outside the frames, each pair of cylinders operating a separate pair of coupled wheels.

The inside cylinders are placed forward of the bogie center, and the outside ones to the rear. The inside cylinders drive the crank axle of the leading coupled wheels, while the outside cylinders are connected to the intermediate coupled wheels. The two cranks on each side of the engine, i. e., one inside and the other outside of the frames, are 180 deg. apart and at right angles (90 deg.) to the cranks on the opposite side. This arrangement greatly improves the turning moment, and as the two pistons on each side of the engine are always moving in opposite directions, a simplified form of valve mechanism is rendered practicable. In these engines the valve gear is of the Walschaerts type in duplicate, one set actuating a pair of piston valves 8 in. in diameter and of extra length, allowing the passages to the cylinders to be practically straight. Inside admission and outside exhaust are adopted, and the exhaust passage is an extension of the valve chest. The inside piston valve in both cases is actuated directly by the Walschaerts gear, and motion is conveyed to the outside valve by con-

necting the two valve spindles by a cross-lever having equal arms fulcrumed on the frames. Neither eccentrics nor return cranks are employed for operating the gear, motion being derived from the reciprocating movement of the inside crossheads, each of which carries a connection to its own combining lever and also a connection through a rod extending back and operating the link for the valve motion of the opposite side of the locomotive.

The two inside cylinders are cast in one piece with the smoke-box saddle, but their center is considerably in advance of the saddle, this being a natural consequence of the location of the cylin-

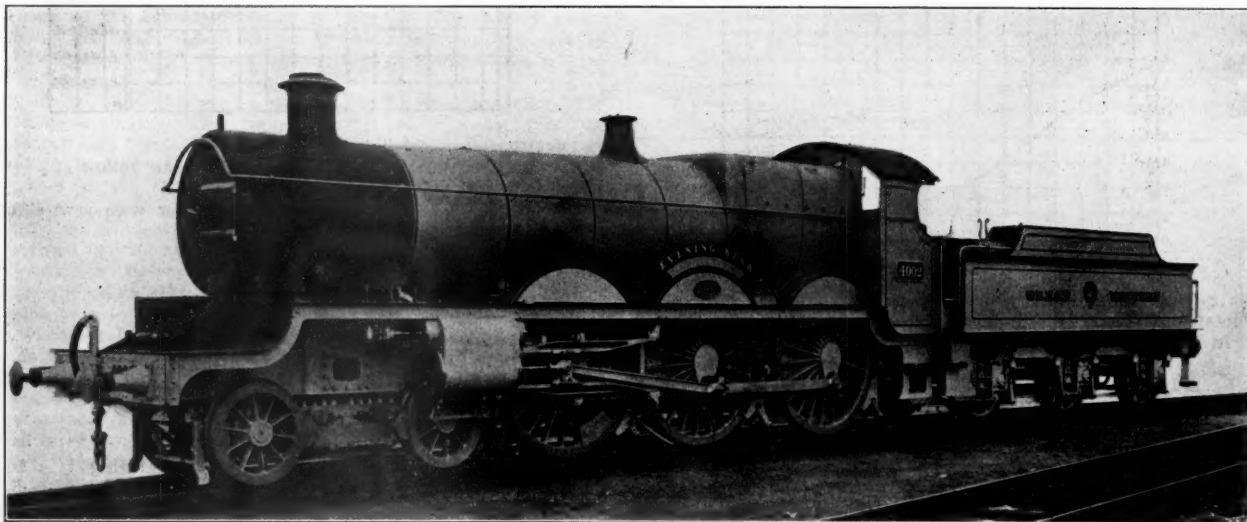


Half Cross Section and End Elevation.

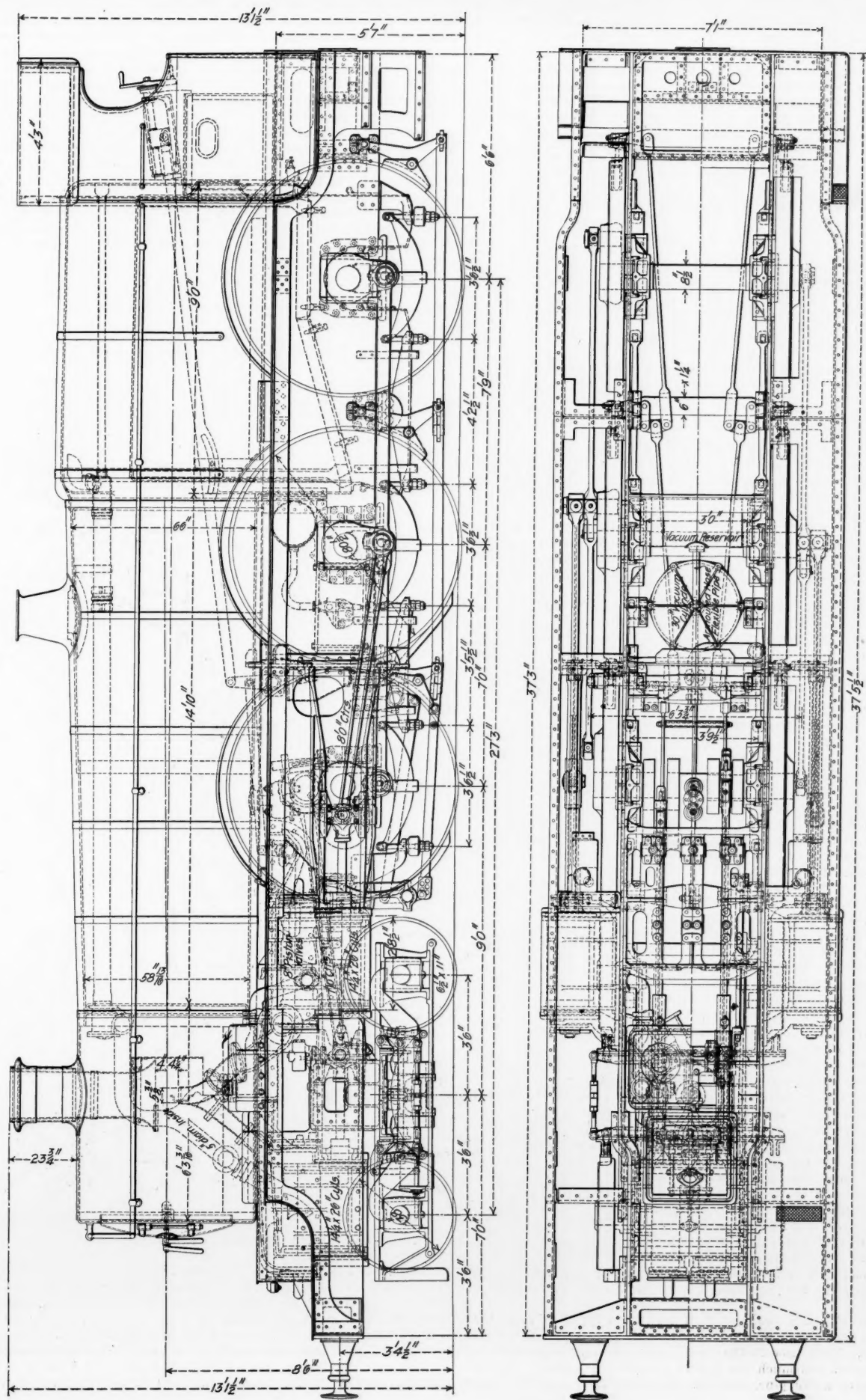
ders over the leading bogie axle. The boiler is of the Great Western standard type, viz.: coned throughout the length of the barrel and fitted with Belpaire type of firebox and extended smokebox.

No dome being provided, steam is collected by a pipe having branched ends, each of which has an upturned mouth near the front of the crown sheet on each side, the throttle valve being in the smokebox.

The crank pin end of the connecting rod for the outside cylin-



Four Cylinder Single Expansion Locomotive; Great Western Railway of England.



Plan and Side Elevation of Four-Cylinder Single Expansion Express Locomotive; Great Western Railway of England.

ders is of the solid bush type. The end of the crank pin has a fine thread cut on it and the cap is screwed on and secured by a threaded taper pin through it. The side rods are secured in the same manner.

These locomotives rank among the most powerful express passenger engines in Great Britain. With ample cylinder and boiler power, an adhesion weight of nearly 60 tons and a high working pressure, they possess all the necessary features toward success in the particular work for which they have been designed.

They have leading dimensions as follows:

Cylinders (four) diameter	14 1/4 in.
Piston stroke	26 in.
Bogie wheels, diameter	3 ft. 2 in.
Coupled wheels, diameter	6 " 8 1/2 "
Bogie wheelbase	7 " 0 "
Coupled wheelbase	14 " 9 "
Total wheelbase	27 " 3 "
Boiler, diameter (front end)	4 " 10 3/4 "
" diameter (firebox end)	5 " 6 "
" height of center from rail	8 " 6 "
" length of barrel	14 " 10 "
Heating surface, total	2,142.91 cu. ft.
Grate area	27.07 "
Working pressure	225 lbs.
Weight in working order	171,584 "
Adhesion weight	131,710 "
Tractive power	23,775 "

The tender carries 6 tons of coal and 3,500 gallons of water. It weighs 40 tons when full.

Production of Lumber in the United States.

The Bureau of the Census, in connection with the Forest Service of the United States Department of Agriculture, has issued a bulletin showing the production of lumber, lath and shingles by states and species in 1906, 1905 and 1904. The figures cover returns from 21,077 mills in 1906, 11,666 mills in 1905 and 18,277 mills in 1904. The total lumber production (excluding lath and shingles) for the United States, in thousands of feet, board measure, was 37,490,067 in 1906, 30,502,961 in 1905 and 34,127,165 in 1904. The state showing the heaviest production of all kinds of lumber in 1906 and in 1905 was Washington, with 4,305,053 thousand feet in 1906 and 3,917,166 in 1905. In 1904, Wisconsin was the state of largest production, with 2,623,157 thousands; Washington was second, and Louisiana third. In 1906 there were 15 states whose production exceeded one billion feet of lumber, board measure. These states, arranged in order of production with the figures given in thousands of feet board measure, are as follows:

Washington	4,305,053	Texas	1,741,473
Louisiana	2,796,395	Pennsylvania	1,620,881
Wisconsin	2,331,305	Oregon	1,604,894
Michigan	2,094,279	California	1,348,559
Mississippi	1,840,250	North Carolina	1,222,974
Arkansas	1,839,368	Maine	1,088,747
Minnesota	1,794,144	Virginia	1,063,241
		Alabama	1,009,783

The production of yellow pine, of course, greatly exceeded all other kinds of lumber and the total figure for 1906 was 13,049,769, the unit being 1,000 ft. B. M. as heretofore. Next in importance comes Douglas fir, with 4,969,843. White pine is next with 4,582,102; then hemlock, 3,508,031; oak, 2,816,077; spruce, 1,645,940. These six kinds of wood were the only ones the production of which amounted to one billion feet B. M. or more. Of the lesser woods, maple was the most important, followed in order by cypress, poplar, redwood, red-gum, chestnut, basswood, cedar, birch, cottonwood and ten other specifically enumerated varieties. Louisiana leads in the production of yellow pine. The great Douglas fir states are Washington and Oregon, and, between them, they produced all but about 200,000 of the production. Minnesota and Wisconsin have a very large lead in the production of white pine. Pennsylvania, Wisconsin and Michigan are the chief hemlock states, while the production of oak is spread with some evenness over 11 states, and is found on a lesser scale in 26 others, Kentucky being the chief producer, with West Virginia next and Tennessee third. About a third of the entire production of spruce comes from Maine, with Washington a poor second and New York third. In New York, however, the figure given is for the year 1905, as the totals for 1906 are not yet available.

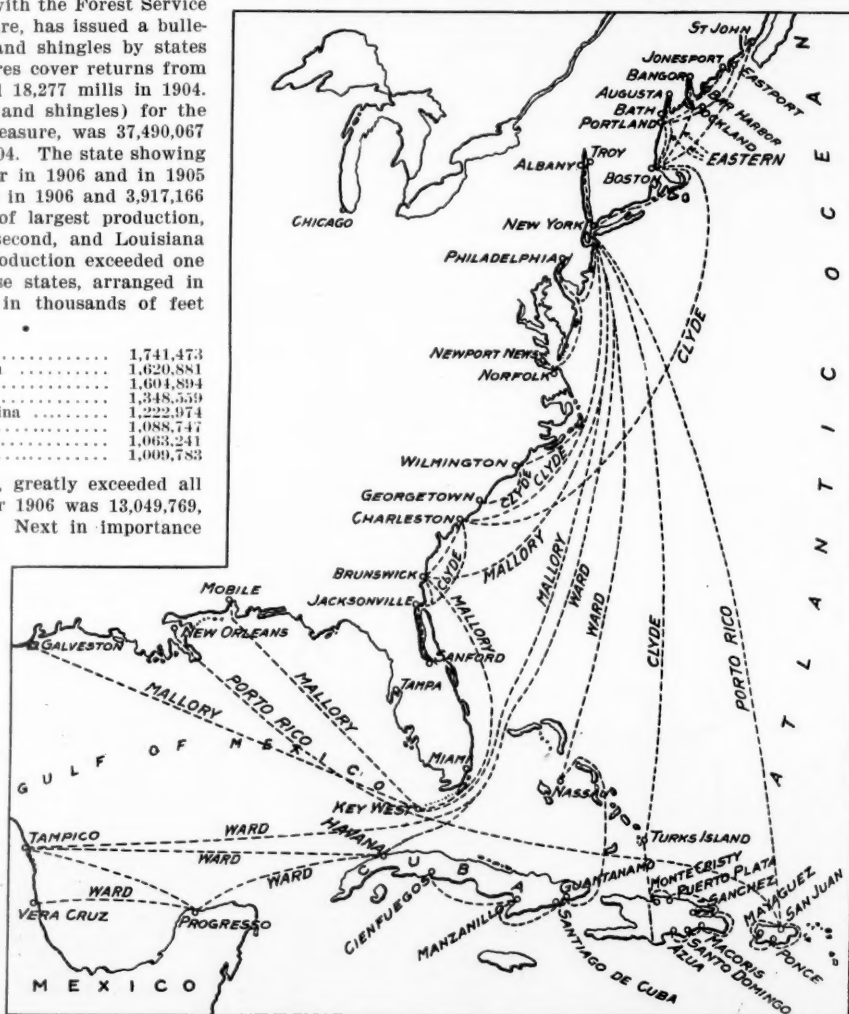
Looking at these summaries in another way, it is seen that Washington is a great producer of Douglas fir, spruce, cedar and yellow pine. Louisiana is the most important single producer of yellow pine and also much the largest producer of cypress. Wisconsin contributes white pine, hemlock, basswood, birch and a number

of other lesser cuts; Mississippi, yellow pine, oak, red-gum and cottonwood; Minnesota, white pine, almost to the exclusion of other woods, but with some spruce and tamarack. Yellow pine furnishes almost the entire production of Texas, although some oak is manufactured, while California divides her cut between redwood, yellow pine, Douglas fir, oak, sugar pine, white fir and a number of other woods of less importance, and easily leads all other states in this relative diversity of production.

Yellow pine is now produced by 38 states and territories, and is the most widely produced lumber of all. Oak comes next and is manufactured in 37 states and territories; ash in 35; elm in 32, and white pine in 30, specifically enumerated, but the manufacture of ash and elm is of comparatively little importance, the total for both woods being 421,140 thousand feet. Hemlock, maple, spruce, poplar, basswood, cottonwood, beech and hickory are also cut almost all over the country, while redwood, the production of which is almost equal to the combined production of elm, ash and beech, is cut only in California. Sugar pine is cut in only two states, California and Oregon; tamarack in three, Michigan, Minnesota and Wisconsin; white fir in eight, and Douglas fir in ten.

The Consolidated Steamship Lines.

The routes of the various companies controlled by Charles W. Morse and his associates, and united as the Consolidated Steamship Lines, are shown on the accompanying map. It will be seen that they cover all the important Atlantic ports and the three most important Gulf ports, besides reaching the two largest ports of



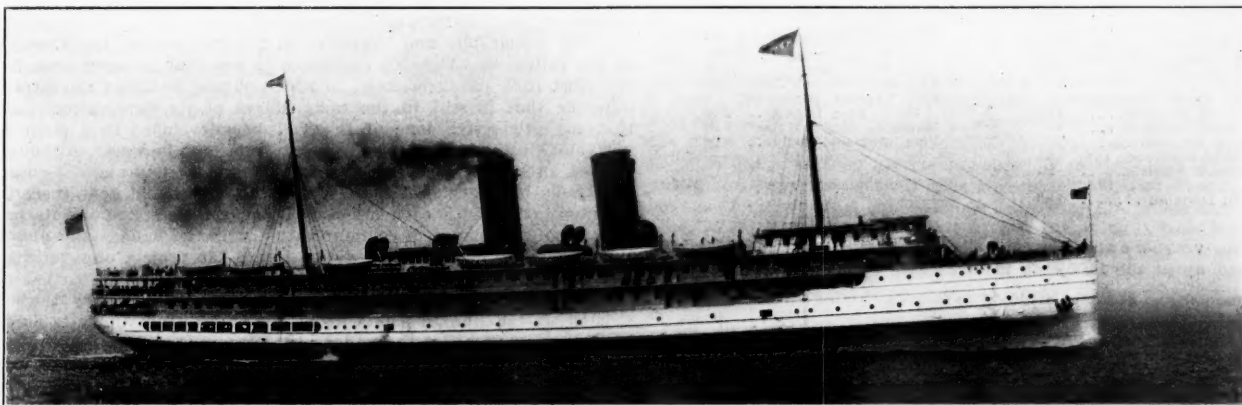
The Consolidated Steamship Lines.

Mexico, Yucatan, Cuba, Santo Domingo, Porto Rico, and the Bahamas. The principal coastwise lines not included in the consolidation are the Old Dominion Line from New York to Norfolk, Va., the majority of whose stock is understood to be controlled jointly by the Southern Railway, Seaboard Air Line, Atlantic Coast Line, Norfolk & Western and Chesapeake & Ohio; the Ocean Steamship Company of Savannah (Savannah Line) from Boston and New York to Savannah, Ga., owned by the Central Railroad of Georgia; the Morgan

Line from New York to New Orleans and Galveston, owned by the Southern Pacific; the Merchants & Miners' Transportation Company, understood to be held, with the Boston & Philadelphia Steamship Company, whose property it operates, as a watch dog, to prevent undue competition by the Morse interests with the New Haven road, and the Maine Steamship Co., formerly an independent line from New York to Portland, Me., but now presumably controlled by the New Haven road also. The Merchants' & Miners' services are between Boston, Norfolk, Newport News and Baltimore; Providence, Norfolk, Newport News and Baltimore; Norfolk, Newport News and Baltimore; Savannah and Baltimore; Savannah and Philadelphia;

Consolidated Steamship Lines are as follows:

MALLOREY STEAMSHIP CO.—*Texas Division*—Between New York and Galveston, Tex., via Key West, Fla.
Mobile Division—Between New York and Mobile, Ala., via Brunswick, Ga.
HUDSON NAVIGATION CO.—*People's Line*—On Hudson River between New York and Albany.
CITIZEN'S STEAMBOAT CO.—*Citizen's Line*—On Hudson River between New York and Troy.
CLYDE STEAMSHIP CO.—*New York Division*—Between New York, Charleston, S. C., and Jacksonville, Fla. Between New York, Wilmington, N. C., and Georgetown, S. C.
Boston Division—Between Boston, Charleston, S. C., Brunswick, Ga., and Jacksonville, Fla.; freight only.
Philadelphia Division—Between New York and Philadelphia; freight only.



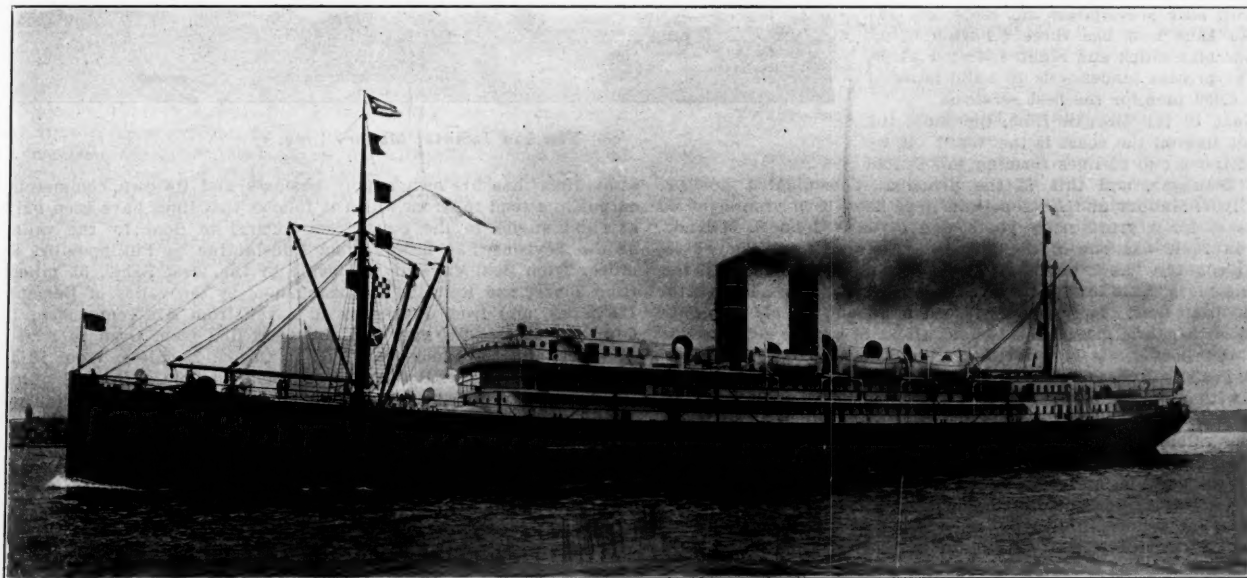
The Yale; Metropolitan Line.

Boston and Philadelphia; Philadelphia, Fall River and Providence, and Savannah and Norfolk, and the company operates a fleet of 24 vessels. The Old Dominion fleet consists of five seagoing vessels, with an aggregate tonnage of 19,700, and nine river steamers. The Savannah Line has ten vessels, with an aggregate gross tonnage of 42,235; the Morgan Line has 19 seagoing vessels with an aggregate of 45,377 tons, approximately, and the Maine Steamship Company has three ships, aggregating somewhat above 8,000 tons, in addition to two sound steamers running on the newly affiliated Neptune Line.

In addition to these well-established concerns, the Brunswick Steamship Company has recently established an independent service between New York and Brunswick, Ga., with four 3,000-ton ships, and another ship is building. In the off-shore service, to which the Cuba and Porto Rico lines of the Consolidated Steamship Company belong, there exists the enormous independent fleet of the United Fruit Company, and subsidiary carrying lines; the Red D Line, the Munson Line, and several other concerns. It must not for a moment be assumed, therefore, that the Consolidated lines have a monopoly of coastwise traffic, although they operate something like half of the coastwise tonnage which is under the American flag.

The routes covered by the companies owned and operated by the

Between Philadelphia, Norfolk, Portsmouth and Newport News, Va.
West India Division—Between New York, Turk's Island, Monte Cristi, Puerto Plata, Samana, Sanchez, Marcoris, Santo Domingo City and Azua.
St. Johns River Division—Between Jacksonville and Sanford, stopping at Palatka, De Land, Astor, Enterprise, and intermediate landings.
EASTERN STEAMSHIP CO.—*Portland Division*—Between Boston and Portland.
Kennebec Division—Between Boston and Augusta, Me., via Bath, Richmond, Gardiner and Hallowell.
Bangor Division—Between Boston and Bangor via Rockland, Camden, Belfast, Bucksport and Winterport.
Portland, Rockland & Machias Division—Between Portland and Rockland via Boothbay Harbor and other intermediate landings.
Boothbay Division—Between Bath and Boothbay, Pemaquid and various points on Sheepscot Bay.
Mount Desert and Blue Hill Division—Between Rockland and Bar Harbor landing at various points on Penobscot Bay.
International Division—Between Boston and St. John, N. B., via Portland, Lubec and Eastport. Also between Boston and St. John direct.
METROPOLITAN STEAMSHIP CO.—*Direct All-Water Route*—Via Long Island Sound and the Atlantic Ocean between New York and Boston; formerly freight only; passenger turbines added.
NEW YORK AND CUBA MAIL STEAMSHIP CO. (Ward Line).—Cuba Division—Between New York and Havana; and New York and Cienfuegos.
Mexico Division—Between New York and Vera Cruz; and New York and Tampico.
THE NEW YORK AND PORTO RICO STEAMSHIP CO.—*New York Division*—Between New York and San Juan, P. R., between New York and Mayaguez and between New York and Ponce.
New Orleans Division—Between New Orleans and San Juan, P. R.
Porto Rico Island Division—Between San Juan and Arecibo, Aguadilla,



The Havana; Ward Line.

Mayaguez, Guanica, Ponce, Jobos (Aguirre), Arroyo, Humacao, Port Mulas (Vieques Islands), and Fjardo.

The following table gives in statute miles the length of the various routes:

Mileage of Consolidated Steamship Lines.		Statute miles.	Statute miles.
MALLORY LINES:		International Division..	351
Texas Division.....	2,225		1,223
Mobile Division.....	1,920	METROPOLITAN LINE:	
Georgia Division.....	914	New York and Boston.....	322
HUDSON RIVER LINES:		WARD LINES:	
People's Line.....	143	New York—Havana...1,196	
Citizen's Line.....	149	New York—Cienfuegos...1,640	
	292	New York—Vera Cruz...1,978	
CLYDE LINES:		New York—Tampico...2,009	
New York Division....	1,420		6,823
Boston Division.....	1,068	PORTO RICO LINES:	
Philadelphia Division..	475	New York:	
West India Division....	1,900	To San Juan, P.R....1,380	
St. Johns River Div....	175	To Mayaguez direct...1,382	
	5,038	To Ponce direct....1,440	
EASTERN STEAMSHIP LINES:		New Orleans—San Juan...1,420	
Portland Division.....	110	Bet. various ports on	
Kennebec Division....	150	Porto Rico Island..	286
Bangor Division.....	234	Humacao—Port Mulas* 18	
Portland-Rockland Div.	167	Port Mulas—Fjardo... 18	
Boothbay Division....	25		5,944
Mt. Desert and Blue			
Hill Division.....	185	Total mileage.....	24,701

*Vieques Islands.

The vessels owned by the Consolidated Steamship Lines are summed up in the following table:

Steamships and Steamboats Owned by the Consolidated Steamship Lines.		
	No. of vessels.	Gross tonnage.*
New York & Cuba Mail Steamship Co., (Ward Line)....	24	76,634
Clyde Steamship Company.....	25	55,145
New York & Porto Rico Steamship Company.....	12	32,618
Mallory Steamship Company.....	12	45,014
Eastern Steamship Company.....	19	23,542
Metropolitan Steamship Co.....	6	18,103
People's Line (Hudson Navigation Company).....	4	7,951
Citizen's Line (Citizen's Steamboat Company).....	4	3,938
Total.....	106	262,945

*Gross tonnages in this table as supplied by the company; not checked.

The largest of these ships are the "Saratoga" and "Havana," of the Ward Line; 6,400 tons gross, twin screw, built in 1907 and 1906, respectively. The "Brazos," building for the Mallory Line, is to be above 6,000 tons; the "San Jacinto" is 6,096 tons, and the "Denver" 4,539. In the entire fleet controlled there are six vessels with a gross tonnage of 5,000 or larger. These represent a very great increase in size and speed from the characteristic coastwise vessel built before the Spanish war. The opening up of Cuban and Porto Rican trade since 1898 has been noteworthy, and the existing fleets engaged in traffic with these islands bear witness to it. An elaborate study of American coastwise development was printed in the *Railroad Gazette*, Aug. 15, 1902, in which it was shown that in 1892 there was only one steamer of 4,000 tons in regular coastwise service between United States ports, while the typical ship of the period had a gross tonnage rather under than over 3,000. The 3,000-ton ship still prevails on the coast, but the Morgan Line now has three 6,000-ton ships, two 4,800-ton ships and eight 4,600-ton ships, and the present tendency is to build boats of about 6,000 tons for the best services.

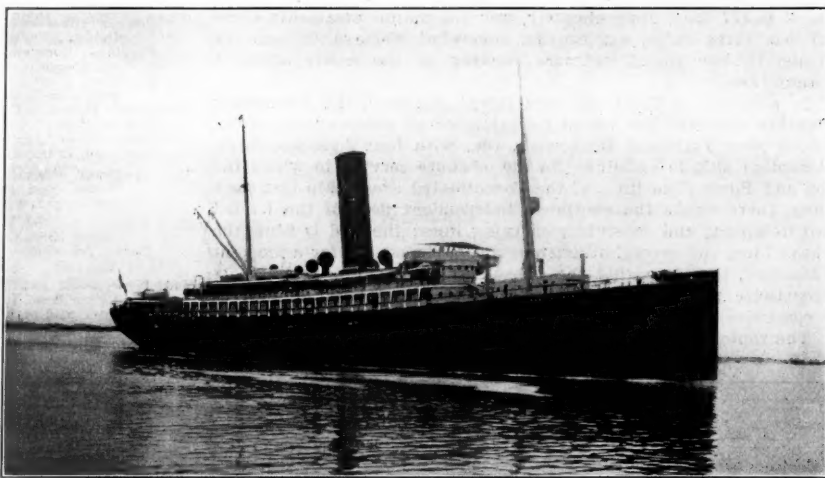
Next to the Morgan Line, the most important line on the coast is the Ward (if we except the group of lines forming the United Fruit tonnage), and this is the principal Consolidated holding. The Clyde, Mallory and Metropolitan lines have been prominent on the coast for a great many years, and Clyde's "John S. McKim," built in 1844, was one of the pioneers of steam coastwise service in this country. As is well known, the new 23-knot triple-screw turbine steamers "Yale" and "Harvard" have recently been added to the Metropolitan fleet. They are the fastest merchant vessels under the American flag, and maintain a 15-hour all-water service between New York and Boston. It is unfortunate that the new owners of these properties should have found it necessary first to load up the original lines with new capital and then issue a sufficient amount of collateral trust bonds and Consolidated Steamship stock to exchange for the values thus created. As a result of the first part of this process, the vessels are capitalized at the enormous total figure of \$326.48 per ton, and this figure is obtained by taking the sum of the underlying capitals only. The holding company capital would work out at a much higher figure, which scarcely needs to be discussed. By comparison, it may be noted that the fleet of the Royal Mail Steam Packet Co. (179,668 tons) is capitalized at the rate of \$54.29 per ton, approximately, and the Union Castle Mail Steamship Co. (260,634 tons) at \$49.77.

African Railroads in Algeria and Tunis.

The question of routes for communication in Algeria was one of the most difficult to meet during the period of the French conquest. In 1830 it was reported that there was not a single road, for it is well known that the routes of travel used by the Arabs were hardly wide enough for a single horseman. The first roads were, therefore, built by military authority, while the first railroad program for Algeria was not drawn up until 1857, and then it was by a decree issued in accordance with a proposition from Marshal Vaillant. Three years afterwards the work was begun and in 1862 the line from Algiers to Blida was opened for traffic. This was followed by the construction of the other lines that now form the system of the Mediterranean colonies of France.

The topography and character of the soil control the location of the railroads. Algerian commerce is one that is dependent, for the most part, on agriculture, to which should be added an extract industry that is still in the early stages of its development. So that the productive zone of the Tell has developed in a strip of variable width, lying along the coast from east to west. Although the sea affords an excellent highway along this strip and the coasting traffic has developed the cities of the littoral and kept them in communication with each other, it is, nevertheless, important that they should be placed in communication with the valleys and plains lying back of them in this region. Hence the project of a railroad nearly parallel to the coast from the Tunisian frontier to that of Morocco, a project which has been enlarged since 1881 by the extension of the line to Tunis about 985 miles from Goulette-Tunis to Tlemcen. Some of the valleys, which unfortunately do not run into each other, have indicated in advance the general line of the road, and have served, in a way, to partially facilitate building it. Such valleys are those of the Medjerda, Seybouse, the West Sahel and Chelif, so that the road cannot be strictly parallel to the coast. It was also turned aside by the massive mountains of Kroumirie, Babor and Djurdjura. In short, the road is not parallel to the coast for the same reasons that the lines from Marseilles to Toulon and from Port-Vendres to Barcelona are not.

In the second place, each of these plains or valleys along the maritime region must be approached through its port, which, at the



The San Jacinto; Mallory Line.

same time, has his own supply business and its own commercial output to attend to, from which it follows that lines have been built at right angles to the coast from Guelma to Bone by the valley of the Seybouse, 34 miles; from Constantine to Philippeville, 54 miles; from Beni-Mansour to Bougie by the West Sahel, 55 miles; from Tiaret and Relizane to Mostaganem by the valley of Demena, 125 miles, and from Perregaux to Arzeu from Ain-Temouchent to Oran, 43 miles. We may add the local line from Oran to Arzeu, 27 miles, and the roads from Tizi to Ouzou, 33 miles; from Blida to Berrouaghia, 51 miles, and from Bone to St. Charles, 62 miles. These roads serve the richest region in the whole colony. They obtain traffic from cereals, fruits, grain, wine and some mineral products, such as the phosphates of Tebessa. There is also a large passenger traffic.

But though the elevated high lands are in a way less richly endowed with natural resources it is nevertheless worth while to give that territory the advantages of convenient means of transportation for the sake of the alfalfa territory on the south side of Saida and the palm groves of Biskra. The high plateaus on the extreme southern side of Algeria, especially those of the southwest, have, throughout all times, been inhabited by a population that was

the least submissive of any in the colony. There has been, therefore, a political and strategic interest in giving to the corps of occupation a means of rapid communication with this less pacific and more suspicious section of the country. Hence, beyond the high lands it has been profitable to unite the region of the Tell with the oasis of the Algerian Sahara, Figuig, El Golea, Ghardaia, Ouargla and Touggourt, where the date plants are marvelously developed, and where the traditional carpet industry still occupies several thousand artisans. By the lines which it has been proposed to build it is finally expected to enrich the Mediterranean ports with the commerce of the caravans from the desert and from the Soudan, and it is believed that by attracting traffic from the Trans-Sahara by way of Figuig, Morocco can be held under French influence. It is for these reasons that these lines penetrating into the interior have been undertaken. Into the department of Constantine three lines have been built, one towards Tedessa, 79 miles, on the Tunisian frontier and the center of the flourishing phosphate industry, whose products, thanks to the railroad, find an outlet at Bone. A second towards Ain-Beida, 58 miles, and a third towards Biskra, 125 miles, bringing an important passenger traffic into this city, which is a source of revenue for it, and is also a valuable means for exploiting the palm industries of the Rir. The Biskra line is now to be extended to Ouargla. On the west, however, principal line of penetration is that which pushes in from Azeu-Perregaux to Saida and Ain-Sefra. This was finished in 1887 and serves for exploitation of the alfalfa products of the high lands of South Orania, while its strategic and political importance seem now to have exceeded its commerce since the Oases of Touat and Tidikelt were occupied in 1900, and especially since the recent operations against Figuig and the difficulties that have arisen in Morocco.

In addition to this, the line has been still further extended towards the south since 1900. In 1901 it ran as far as Duveyrier; in 1902 to Beni-Ounif, at the gates of Figuig, 397 miles from the Mediterranean, creating a true center of population and of commerce. On the 16th of last October the Minister of the Interior, M. E. Etienne, opened the last extension to Bechar. An old project was to run the line to Igli, but French political interest is evidently pushing on the rails on to Kenadsa and probably beyond.

A prolongation of the Grand Central Road from Tunis to Tlemcen on towards Morocco is also being built, and a law of the 29th of December, 1903, authorized the building of a trunk line from Tlemcen to Lalla-Marnia on the Morocco frontier, whence it can be extended at any time still further west towards Fez, Mequinez and the Atlantic. It will thus serve as an efficient means for the pacific entrance into Morocco.

Finally, the two lines which were recognized in 1900 to be of great public advantage, namely, that from Ain-Mokra to Jemmapes, 40 miles; and that from Ain-Beida to Henchela, 30 miles, have been finished. The influence of the Algerian system is quite manifest, and for a long time there has been a general demand for a real connection between Ain-Beida and Tebessa and between Biskra and Ouargla; between Setif and Bougie, Tenes and Orleansville, as well as double track for the Grand Central over the Boura-Aumale-Affreville, which has a length of about 150 miles from east to west. The main system of railroads in the Mediterranean colonies takes no account of this lack. For a comparatively small sum the existing roads, which are about 1,900 miles long, could be extended so as to make connections with each other, such as the Paris, Lyons & Mediterranean, the Eastern Algerian, Western Algerian, the line from Bone to Guelma and the State Railroad. The multiplicity of the companies increases the general expenses and prevents the undertaking of large projects, and frequently leads to a false spirit of jealousy between them. For example, Philippeville has for a long time complained that by means of reduced rates the Eastern Algerian has drawn off the traffic which naturally belongs to it to Algiers or Bougie, and it is only recently that the company has begun to make through rates and run connecting trains. As all the roads do not have the same gage, it follows that there must be frequent transferring of passengers and trans-shipment of freight, which are unceasing causes of delay and expense. This is due to the fact that the first Algerian lines were built at a time when the narrow gage system was not contemplated at all, and when they wished to give the colony a system based on the large metropolitan roads of the more thickly inhabited countries. The Grand Central Railway was built with a gage of 4 ft. 8½ in. and should be finished throughout with the same gage. Recently the spurs which make direct connection with it have been built to that gage.

With the exception of the one from Biskra, all of these branch lines have the standard gage. The others that penetrate into the interior, which were built after the Grand Central, have profited by the experiences with the narrow gage, and have, for the most part, been built with a narrower gage, that is, from 3 ft. 3½ in. to 3 ft. 5 in., by which greater economy in rapidity of construction has been obtained.

Finally, all the railroads, which are given a certain annual subsidy by the state, under the form of guaranteed interest, have a natural tendency, although it is not in accord with public welfare,

to obtain these subventions in construction rather than by an improvement of their service. Consequently they have failed to agree to any lowering of rates and improving of rolling stock. A minimum amount of income is quite sufficient for them and they expend it to-day in attempting to exploit new enterprises rather than to increase their current revenue.

A portion of these shortcomings will be very slow in disappearing. The law of December 19, 1900, gave Algeria a separate civil service and budget, and it reserved for the general government the right to purchase the existing lines, to modify their constitution and to extend them. The recent trip into Algeria of M. Gouthier, Minister of Public Works of the former cabinet, seems to have had for its object a study, on the spot, of these serious questions. On the 30th of May, 1906, a plenary assembly of the financial delegations decided upon the proposition of the government to purchase the East Algerian Railway and have it exploited by the colony.

The Tunisian railroad system, although connected with that of Algeria and forming a part of it, has fewer defects. As in Algeria, the main line in Tunis has a number of important branches. The large military port of Bizerte has been connected with Tunis, 73 miles, and from Tunis itself lines have been built out towards Zaghouan, 53 miles; Hammamet-Sousse-Kairouan, 129 miles, and Moknine, 30 miles from Sousse. All of these lines have been built by the same company, namely that of Bone-Guelma. The branch line from Bizerte, which runs along the coast and connects directly with the Grand Central, is the only one which has a gage of 4 ft. 8½ in.; the others have a gage of 1 ft. 3¾ in., or one meter.

Further south, Sfax, which, in 1897, was opened as a deep-water port, has been connected with Gafsa and Metlaoui, 151 miles, by the Gafsa Phosphate Company which, in a few months, and without any assistance from the state, has built the whole line; this road will also be of meter gage, and is one of the finest industrial enterprises in the whole regency. Finally, as authorized by the law of April 30, 1902, the Tunis government has borrowed \$8,000,000 for the extension of its railroad lines, and is now either building or has in contemplation lines between Bizerte and Nefzas, Tunis-Pont-du-Fahs and Kef, the same point, and Kalaa-es-Senam, in order to reach the rich region of Mektal, Kairouan and Sbiba, and, by a prolongation of the Sousse-Kairouan and the Sousse-Sfax lines, to connect the southern line between Sfax and Gafsa with the Tunisian system. A trunk line, which will be of strategic importance, will also connect the road leading to Nefzas and Bizerte with the trunk line of the Medjerda and Algeria. It is interesting to note that the greater portion of these new Algerian or Tunisian lines owe their existence to the discovery of rich mineral deposits. There is also a striking proof of the development of the extract industry in the Barbary states, which were, up to this time, exclusively agricultural. In Tunis there was the prospect of the mines south of the Sfax-Gafsa lines that were considered before the high plains and plateaux at the center had developed their value to any extent. The Kalaa-es-Senam line was built because they wished to exploit a new phosphate deposit which had been discovered in the Mektal region. The Nefzas line is intended for the transportation of the minerals along that road. This economical transformation of the colonies has its counterpart in the development of the ports; Bougie, and especially Bone, which the fortunes of Algeria and Oran have eclipsed, are now taking on a new lease of life, and the Nefzas mineral resources have given to Bizerte the essential conditions of a prosperous port and an attractive point for a heavy tonnage. The future of Bizerte as a coal depot depends upon this road.—*Moniteur Industriel*.

Twenty-fifth Anniversary of the Abt Rack-Road.

In the early part of August was celebrated the twenty-fifth anniversary of the Abt rack-road system of traction. Twenty-five years ago the Harz mountains were suffering from the lack of railroad facilities to transport to market their store of timber, building stone, lime and ore. The examination of the various economic problems connected with building a railroad into the heart of the mountains was intrusted to Albert Schneider, manager of the Halberstadt-Blankenburg Railroad. After careful examination he recommended building a standard gage, thus providing for free interchange of cars at all junctions. He insisted on the superior advantages of the standard as compared with the narrow gage, subsequent results bearing out the correctness of his position, and proving that in following his recommendation no mistake was made.

The serious problem that confronted Mr. Schneider was to build a standard gage road without too great a length of line. For its solution Mr. Schneider turned to Roman Abt, who had been associated for many years with Riggenbach, the inventor of the ladder rack. To meet the requirements of the Harz railroad, Abt designed the rack-road that bears his name, and a locomotive for combined adhesion and rack traction, a system of construction that has since found application in all parts of the globe.

On Aug. 1, at a reception to Mr. Abt at the home of Privy Counsellor Schneider in Harzburg, the latter presented to Mr. Abt, now

President of the Gotthard Railroad, a cup, a beautiful sample of the goldsmith's art, the cover of which bore an image of St. Christopher, thus typifying that Roman Abt had, by his invention, carried him and his project across difficulties to success. Excursions over the road were followed by a banquet at Blankenburg at which the mayor announced that the city authorities had named a street in honor of Roman Abt.

Recent State Railroad Legislation.*

The past year bears many resemblances to the period of the Granger agitation. Railroad legislation by the states, however, has been far more widespread. Not only the states in the central and far West but those in the supposedly more conservative Atlantic seaboard region have taken a large part in passing railroad laws. In their number and in the wide range of subjects with which they deal, if not in their severity, the laws affecting railroads passed at the recent sessions of the state legislatures are entirely unprecedented. It has been calculated that the number of such laws passed within the last year is about three hundred. Ten state legislatures alone at their recent sessions passed 177 different laws affecting railroads.

The legislation deals with almost every department and innumerable details of railroad operation and management; from reduction of passenger fares to dusting of passengers cars; from establishing railroad commissions more powerful than any ever before created to requiring railroads to run only eight-wheel cabooses.

Twenty states have passed laws reducing passenger fares, this last not including Ohio, which reduced passenger fares to two cents a mile in the spring of 1906. Arkansas, Georgia, Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Oklahoma, Pennsylvania, Virginia, West Virginia and Wisconsin have fixed passenger rates at two cents a mile, though certain of these have slight exceptions to this requirement, such as providing that small railroads may charge more. The governor of Kansas has recently intimated that he will call a special session of the legislature unless the Railroad Commission acts to secure a two-cent fare. North Carolina has established $2\frac{1}{4}$ cents a mile as the legal rate on roads 60 miles long or over; Alabama, $2\frac{1}{2}$ cents a mile on roads over 100 miles long. In South Dakota the Railroad Commission has been ordered to make a valuation of the road, and then proceed to establish rates at not over $2\frac{1}{2}$ cents a mile. It is to be observed that such reductions have been made, not on the basis of density of population or of travel, but indiscriminately; in the West and South, as well as in the thickly populated states of the eastern seaboard.

Freight rates have been reduced by the legislatures of Alabama, Michigan, Minnesota, Missouri, Nebraska, Nevada, North Carolina and, through the Railroad Commission, in Georgia, Iowa, Kansas and Texas. Iowa has also made an appropriation for an investigation of freight rates, under which if an interstate rate is lower than an Iowa rate, the latter will be considered *prima facie* unreasonable—this in face of the generally higher expense of handling local than through traffic.

Next in importance to these rate reductions are the so-called "reciprocal demurrage" laws, which provide that a railroad which does not furnish cars when demanded by a shipper must pay a penalty for each day that the cars are not available. Such laws have been passed in Alabama, Colorado, Indiana, Kansas, Minnesota, Missouri, Oregon, South Dakota, Texas, Vermont and Washington.

Another set of laws which, though often entirely justified, bear heavily on the operating expenses of railroads, are those limiting or regulating the working hours of employees. Such have been passed in Connecticut, Indiana, Kansas, Maryland, Minnesota, Missouri, Montana, Nebraska, New York, North Carolina, South Dakota, Texas and West Virginia. In many cases they will involve rearrangement of the operating divisions, sometimes with consequent changes and abandonment of facilities already in existence.

Laws of the same general class, though usually dictated by the labor unions rather than by necessity, are those fixing the minimum number of men to be employed in a train crew, which has been prescribed by law in Arkansas, Indiana, Kansas, Texas and South Dakota. A set of enactments also tending to raise the cost of railroad operation, are those extending the railroad's liability as an employer for accidents to employees, due to negligence of fellow-employees or in part to contributory negligence by the injured party. The employer's liability has been broadened in Iowa, Kansas, Michigan, Nebraska, Oklahoma, Pennsylvania, South Dakota and Wisconsin. There are also two states, Indiana and Minnesota, in addition to Massachusetts, which has had such a law for about a year, in which the use of the block system is now compulsory on the order of the Railroad Commission.

Many new railroad commissions have been established, most of which are "strong," that is, have the power to make rates. Ala-

bama is to have a commission of three members, elected by popular vote. Colorado's new commission of three members was to have taken office on June 10, but the commissioners have been enjoined from exercising their functions. In Michigan, there are to be three commissioners, instead of one. Montana, Nebraska, Nevada, New Jersey and Pennsylvania have established railroad commissions. The New Jersey and Pennsylvania commissions do not have the rate-making power. In Arkansas and Iowa the powers of the existing commissions have been greatly enlarged. New York leads all the states in the strength of its new commissions. The New York commissions, in fact, mark a distinct step in advance in the regulation of railroad corporations.

These general groups cover the most important of the new railroad measures. Besides, there are a great number of other miscellaneous provisions affecting railroads. Fair distribution of freight cars under heavy penalties; the building of private sidings; the establishment of joint passenger stations at the intersection of two or more lines; the recording and investigation of railroad accidents; payment for confiscation of coal for railroad use; the registration of railroad lobbyists; the use of safety appliances; the placing of telephone pay stations in railroad stations; the improvement of train rules; the blocking of frogs and switches, and the use of electric headlights, are all required by one or more of the new laws. Still others prohibit a railroad from transporting its own products or manufactures except for its own use; require railroads to be fenced on both sides; fix the minimum age of night telegraph operators and towermen; bring express companies and private car lines under the power of the railroad commission; increase (in six states) the taxation of railroads, and require the carrying of passengers on freight trains. In Kansas any railroad officer or employee failing to do this last is liable to imprisonment as well as fine. Vermont has made any train employee found intoxicated liable to imprisonment for one year, besides subjecting a railroad company to \$3,000 fine for employing trainmen known to have drinking habits. These are merely instances of the miscellaneous laws on railroad subjects. Some of them are obviously in the direction of a better standard of railroad operations; some of them are meddlesome and unjust.

In spite of the fact that many of the most important of the new laws are and for some time will be under determination by the courts, it is possible in the large to reckon the causes and results of this great anti-railroad legislative sweep. There is no doubt that there was much justification for it. By discriminating contracts, by selfishly influencing legislation, by petty but obnoxious regulations, and by arbitrary exercise of power, the railroads as a class—there were, of course, striking and satisfactory exceptions—laid up for themselves a store of pent-up hostility whose flood-gates have of late been thrown open. This hostility was increased by ignorance of railroad problems.

As with all too long delayed reforms, the pendulum swings too far. There is no doubt that many of the railroad laws recently passed are most unjust. They will hurt the railroads and eventually and in consequence the communities which adopted them. They have already resulted in abandonment of many railroad improvements. It will take time to get rid of the dross in the new legislation—the politics, the demagoguery and the injustice; but there should remain from the refining process, the gold—higher standards of railroad operation, a franker relation between railroads and the public, and the elimination of the railroads from politics. Added to this will be the contingent advantages of the wisdom brought by the widespread investigation of rate problems under court direction and the knowledge gained from experiment and experience in railroad regulation.

This is the bright side of the anti-railroad legislation of the past year. Most of it, whether justified or not, is severe in its effect on the net earnings of railroads; much of it, unjust; yet as its result there should come a period of fairer dealing and better understanding between the railroads, their patrons and the State.

Foreign Railroad Notes.

The Pilgrims' Railroad to Mecca has now more than 500 miles of track laid. There are 1,000 miles more to build to reach Mecca.

An official investigation of conduct of traffic on the part of the Siberian Railroad east of Lake Baikal, made for the Minister of Railroads, has brought to light an astonishing condition of things. Enormous quantities of freight have been delivered to persons to whom it was not consigned, and in many cases the actual consignees have recovered for the loss of the freight which it was pretended had not arrived. This has been going on since 1904, and the total loss is said to amount to the incredible sum of \$5,000,000. The discovery, after all, was made by accident. A policeman fished out of the Angar river a bundle of documents, which turned out to be a report of a previous inspector, which some interested party had stolen, and, as he supposed, made away with.

*From an article in the *Boston Evening Transcript*, by Hugh Rankin, Associate Editor of the *Railroad Gazette*.

GENERAL NEWS SECTION

NOTES.

Suit will be begun in the courts by the Green Bay & Western Railway to test the two-cent passenger law passed by the last Wisconsin legislature.

On Sunday, September 29, the number of freight cars passing Lewistown Junction, Pa., on the Middle division of the Pennsylvania Railroad, was 8,630, or nearly 600 cars more than the best previous day's record.

Dwight C. Morgan who, with 20 engineers to assist him, has been engaged for a year and a half in making a valuation of railroads in Minnesota, announces that the results will probably be known within a year.

A member of the State Railroad Commission of Washington is in St. Paul, Minnesota, to arrange for a conference of the commissioners of the states through which run the railroads between St. Paul and the Pacific coast, with a view to considering uniform action on freight rates.

At San Francisco, September 27, the Grand Jury in the Federal court returned indictments against the Southern Pacific Company and the Pacific Mail Steamship Company for violation of the Interstate Commerce law in making discriminatory rates on freight from Asia to Chicago and New York.

Press despatches from Toledo, September 28, report a strike of railroad clerks in that city which is said to have been participated in by about 400 men. The roads named are the Wheeling & Lake Erie, the Toledo, St. Louis & Western, the Ohio Central, the Hocking Valley, the Michigan Central and the Pere Marquette.

The railroads of Nebraska failed in their effort to secure from the Federal court an injunction restraining the officers of the state from enforcing the reductions in rates recently ordered, but the counsel of one of the companies says that the roads will continue their efforts to secure a judicial decision on the validity of the laws.

The New York Central has taken off 10 trains from the Yonkers branch of the Putnam division and has reduced the number of cars in many of the trains which are still running. These trains are run to accommodate the local traffic between Yonkers and New York city, and it is said that this traffic over this line has fallen off.

The Missouri Pacific, answering a suit of the Attorney-General of Missouri, declares that ownership by the company in coal mining companies and an elevator company are necessary to the proper conduct of the business of the road; that is to say, necessary for a regular supply of fuel and for the proper accommodation of grain shippers.

The state railroad commissioners of Massachusetts have called upon the Boston & Albany to report, for the three weeks ending October 19, all passenger train delays of over 10 minutes, except those on runs of less than 25 miles. Business men of Boston and other cities have made many complaints of exasperating delays and long continued annoyances.

The Huntingdon & Broad Top Mountain, which originates a considerable quantity of coal for New England, has notified shippers that it will hereafter charge them \$2.50 each on cars going to points on the New York, New Haven & Hartford. This, evidently, is a precautionary measure, to guard against loss by reason of difficulty in collecting car service from the New Haven road, which has withdrawn from the per-diem.

The Illinois Traction System, operating interurban electric roads in Central Illinois, is said to have abolished the use of oil lamps for tail signals on cars, and to have adopted instead electric lights, which are fed through storage batteries, thus insuring the continuity of the lights even if the power current should be cut off. This company has also adopted the use of red flags instead of green for the day-light tail signal.

Governor Comer, of Alabama, has written letters to all the members of the legislature of that state advising them that he is going to call a session about November 2. The Governor's principal object appears to be to secure compliance by the Louisville & Nashville and the Central of Georgia with the rate-laws recently enacted in Alabama, all of the other companies in the state having put the reduced rates in force.

The Duluth, South Shore & Atlantic Railroad hereafter will carry no baggage on passenger trains except travelers' proper belongings in the true sense of the term. Boxes of provisions, bags of potatoes, cans of oil and the like will be carried only by freight. The new order is to prevent the demoralization of the passenger service which has attended the transportation of hunters each fall

for many years. With their bulky and awkward baggage it has been impossible to maintain schedule time.

On the Galveston, Harrisburg & San Antonio caution signs have been set up 500 ft. from every curve of 4 deg. or more for the purpose of warning engineers against running through the curve at excessive speed. These signals are set 7 ft. from the rail on the engineer's side, on posts. The blades are fish tailed and are painted yellow, while the supporting posts are painted white on the front, and the sides and back brown. First class trains are to reduce the speed to not more than 30 miles an hour, and all other trains to 18 miles an hour.

On September 25 the Attorney-General of the United States, acting on information gathered by the inspectors of the Interstate Commerce Commission, ordered the prosecution of 37 railroads for 287 violations of the safety appliance law. Besides a number of prominent railroads which have been prosecuted before, there are several small lines in the list, as, for example, the Chesapeake Beach, the Detroit & Toledo Shore Line, the Louisiana Western, the Nevada-California-Oregon, the St. Clair Tunnel Co., and the Williamsport & North Branch.

The steamer "Harvard," of the New York and Boston through line, reached New York on Monday afternoon last nine hours behind time, having been delayed that much in starting from Boston harbor on account of a high wind. According to one statement the wind was blowing 85 miles an hour. Some of the passengers demanded to be taken back to Boston, but the captain said that that could not be done. The steamer arrived in New York at about the time that she should have begun her eastward journey, and the eastward passengers had to wait about three hours before they could start.

The circulating "newspaper library" of the Southern Pacific, established some years ago for the benefit of the track-repair men and their families in the desert regions of Arizona and other parts of the Southwest, now has 200 distributing centers, to which 4,000 newspapers, magazines and books are supplied every week. The packages of papers are thrown off at the section houses, a distinctive whistle signal being given by the engine of the train which brings them. The distribution of the papers to the several families is in most cases managed by a woman, the section master's wife, we suppose.

During the present month the Railway Mail Service Department is to weigh all mails on all routes, Congress having made a special appropriation of \$300,000 for this purpose, with a view to securing a more accurate basis of compensation than by the weighing at different times in different parts of the country, as has been the custom. It is also said that the Postmaster-General, supported by the President and the Attorney-General, has decided to count Sundays in the number of days used as a divisor in ascertaining the average weight per day; that is to say, the total quantity carried on a given route during a week of seven days is to be divided by seven to get the daily average, instead of being divided by six, as heretofore.

The new law of the state of New York, limiting the working hours of telegraph operators, went into effect on October 1 (the same date on which a similar law went into effect in several other states). A New York City reporter finds that several of the roads are unprepared to comply with the law, and the reason appears to be that competent telegraph operators are very scarce. Someone on the New York Central estimates that that company will have to increase its force by about 1,000 men. A press despatch from Poughkeepsie says that the New York Central has rescinded its order making a reduction of \$2.50 or more a month in the wages of operators whose hours have been reduced from 12 to eight. It is said that 460 operators, presumably those who recently struck and left the service of the Western Union and Postal Telegraph companies, have left New York city to take situations in other places, and that 300 of these are now working for railroads. Forty of the strikers are now employed by wireless companies.

Cost of the Grand Trunk Pacific in Eastern Canada.

At the time the Grand Trunk Pacific Railway project was before Parliament four years ago, it was estimated that the eastern division from Moncton, N. B., west to Winnipeg, Man., 1,800 miles, would cost in the neighborhood of \$100,000,000. But with the increased cost of labor and of material of all kinds it is probable that the outlay will be fully 25 per cent. more than was expected. Labor which was then available at \$1.50 and \$1.75 per day is now \$2.25 and \$2.50. Ties that were to be had in abundance a year or two

ago at 30 cents each, are now bringing 60 and 75 cents, while in some instances the contractors have been unable to obtain sufficient supplies at any price. Rails are dearer, food is more expensive, everything, in fact, that enters into the execution of this enterprise, is increasing in price.

A considerable part of the eastern division across Northern Ontario is through a region so remote as yet from existing railroads that construction would be very costly. To put parties in the field throughout the whole 1,800 miles from Moncton to Winnipeg would involve much greater outlays than the transcontinental commissioners feel justified in incurring.

The Railroad Regulation Movement.*

As a result of legislation already enacted, railroads are now subject to vastly more regulation and are conducted with far more publicity and are held to a far stricter accountability than any other form of capital or enterprise. There is no serious wrong which a railroad can do that is not susceptible of substantial correction, and generally such correction can be accomplished by public officers without expense to the individual. Therefore it would seem that all that is required is for the public authorities to enforce the numerous laws already in effect. Strange to say, however, the principal talk is about further railroad regulation.

Railroad regulation is the political field most easily cultivated and most fruitful in results to the politician. It is human nature to be distrustful and critical with respect to great wealth, and this distrustful and critical sentiment has generally settled especially on the railroad, for in most communities the railroad is the most tangible and obvious form of accumulated wealth.

But the political advantage of attacking the railroads is a commodity which is consumed in the using. The politician who scores by securing railroad regulation feels that to continue his success he must score again by securing still further railroad regulation. His rivals feel that they must find other ways to score in the same game so as to restore their prestige. Competition is said to be the life of trade, but competition among the politicians is proving almost the death of the railroad trade.

Striking illustration of the political competition in railroad regulation is shown by the unwillingness of Governors and legislators to leave the state commissions the administration of the subjects within the jurisdiction of the commissions. Apparently there is fear lest the commissioners get political credit which others are anxious to appropriate. Thus we find in states where the commissions have ample power to reduce rates and have the machinery for making thorough investigation to ascertain whether rate reductions are proper that the legislators, with the approval of the Governors, rush in to make reductions on their own account and without investigation. Governor Hughes' veto of the 2-cent rate bill in New York was a striking exception—an exception which proves the rule.

Passenger travel is a luxury to a much greater extent than is the transportation of freight. It is absolutely necessary for people to have fuel, and food and clothing, but it is rarely absolutely necessary for people to travel. Therefore, from the public standpoint, passenger rate reduction is even more unimportant than are freight rate reductions. Passenger business is far less profitable to the railroads than is the freight business. Therefore, from the railroad standpoint, passenger rate reduction is much more unjust than freight rate reduction. Yet passenger rate reduction is the form of rate legislation which has proved most popular with legislatures. The only explanation is that a reduction in passenger rates is more obvious to the voter and therefore has more political advantage.

For several years the railroads have been struggling to meet a demand for transportation which has increased far more rapidly than it has been possible to increase facilities. The most earnest and persistent efforts have been made to meet the demand; the difficulties have been enormous. Probably no class of persons in the country has been under such a severe and prolonged physical and mental strain as railroad officers and employees. My experience is that railroad officers have striven more faithfully than any other class in the country to comply with both the spirit and the letter of the laws regulating them.

Yet the railroads have had no credit for their efforts, or for what they have accomplished. The public has been talked into a remarkably hysterical frame of mind. It is generally accepted that the psychology of the crowd is a different thing from the psychology of the individual. If then we look at the public as a separate entity, we have the condition of a very nervous person who is beset by a multitude of physicians, each of whom is suggesting some different form of disease which the person has and some different sort of cure. We know the unfortunate results which always follow in the case of a nervous individual when he comes under the influence of even one physician who is an alarmist. We are beginning now to

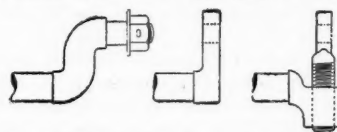
realize how a similar condition may exist with respect to the public as a whole with reference to the railroads.

Railroad companies, generally speaking, are earning less than a fair return on the value of their property. The Atchison, Topeka & Santa Fe in the year ended June 30, 1907, the most prosperous in its history, earned only 6½ per cent. on its total capitalization. The par value of its capital is not believed by its officers after a careful study of the problem to represent any more than the present value of its property. What other business in its most prosperous year would earn as small a percentage?

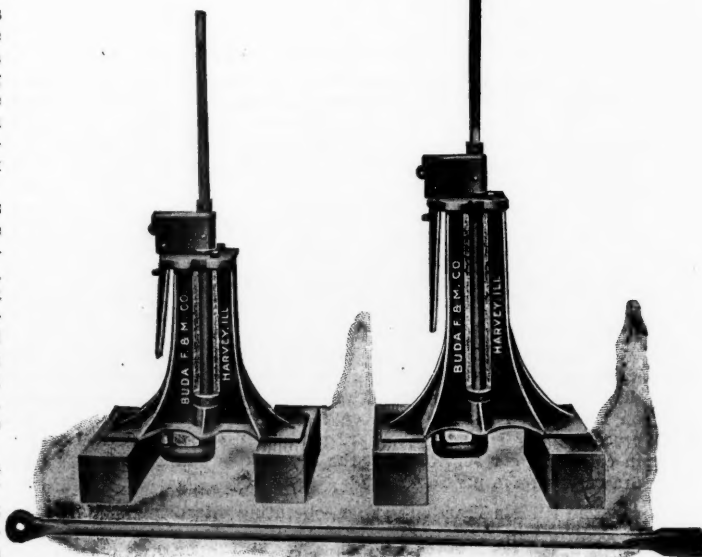
Railroad agitation will never cease as long as the politicians believe it is profitable. It will cease to be profitable when the public fully understands the present conditions and their consequences. We have heard in the past a great deal about undigested securities. We are now suffering from undigested railroad laws. Before passing more laws the Federal Government and the states ought to take time to understand and enforce the laws they have. If they do not, the ingenuity of politicians can forever suggest new laws to pass. In a word, I say to each of you as good citizens and in the public interest fully as much as in the railroad interest, do your best to discourage the professional maker of anti-railroad laws, and do your best to encourage the administrator of the laws already made to study the facts thoroughly and then enforce the laws accordingly. What the public needs is a fair investigation of the facts and intelligent enforcement of the laws already passed.

A New Form of Switch Stand.

A new high and low form of switch stand has been added to the 50 or more styles which the Buda Foundry & Manufacturing Co., Chicago, makes. This form is built to meet the demand for a



Styles of Crank for Buda Switch Stand.



New Buda Switch Stand.

stand combining lightness and strength. The frame, the lever and the housing over the latter are malleable iron. The housing protects the lever against snow and ice, and also makes a convenient place for the switch lock. The mast and crank are wrought steel. The illustration shows the style having the crank of the turned-up toe form, with which it is impossible to remove the switch rod when the stand is locked. The rod can be taken off only when the stand is in an intermediate position. Other designs of cranks are provided, as shown in the small cut. The turned-up or turned-down toe has the switch rod shown with the stands. Where the stand has a horizontal rigid crank, or adjustable crank, as in the other designs, the connecting rod has a jaw at each end. By extending the crank below the base the use of a straight rod is permitted, which is considered an advantage. The stands may be had either two-way or three-way. The frame has no bolts, avoiding the possibility of its being tampered with.

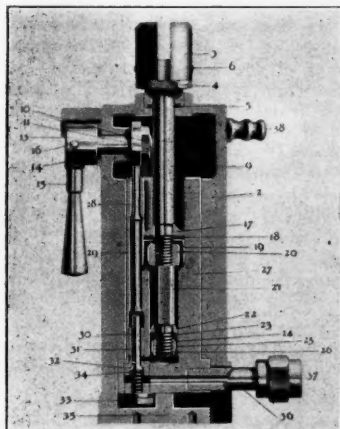
*Abstract of an address by Walker D. Hines, General Counsel of the Atchison, Topeka & Santa Fe, before the Traffic Club of New York.

Price's Automatic Stop.

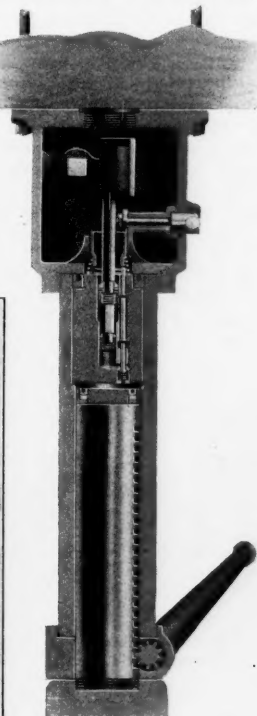
An automatic stop devised by Prof. H. W. Price, of Toronto University, is in experimental use on six miles of the Intercolonial Railway near Moncton, N. B., and two locomotives are equipped with the apparatus. There are no visual signals on this section of the road and the arrangement is essentially an apparatus for applying the air-brake, in case an engine overruns the point where it should stop. When the stop signal operates, it blows a whistle in the cab of the locomotive. The trial equipment is on single track and is controlled automatically, through track circuits, the same as visual automatic block signals.

The New Dudgeon Universal Jack and Hydraulic Pump.

The first hydraulic jack was patented by Richard Dudgeon in 1851. Improved forms were brought out by him in 1873 and 1884, and all of these types are still made. Recently a jack has been designed which embodies a number of new features intended to meet the demand for a compact light-weight jack, easily operated and controlled and combining great power with high speed. It has a double pump, which enables the ram to be run out under a light load with twice the speed of the single pump. Under a heavy load a quarter turn of the valve handle throws out the large pump and gives the action of a single pump jack. The special feature of this jack, however, is the assembling of all the valves in one valve chamber and the reduction of their number from the usual arrangement of three-



Dudgeon Universal Force Pump.

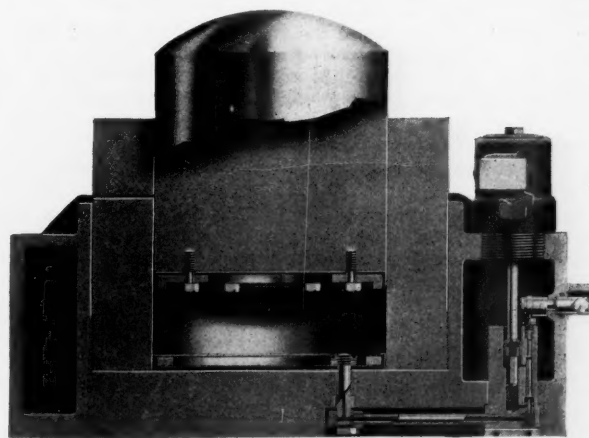


Dudgeon Universal Beam Jack.

of the liquid from the small bottom pump. To release the pressure the handle is turned horizontally to the right, causing the cam to force all three valves off of their seats, which allows the liquid to flow back into the reservoir at the top. The reduction in pressure can be graduated to any required degree and can be instantly arrested by returning the valve handle to the vertical position. The pump illustrated weighs only 31 lbs. and is designed for working pressures up to 1,500 lbs. per square inch.

The only differences in the construction of the jacks is the addition of a push tube inside the ram surrounding the piston rod and resting on a stiff spiral spring on top of the cylinder. The top end of this tube bears against the valve handle cam and the lower end bears against the top valve spindle. A pin is also provided on the piston rod head which bears against the top end of the push tube when the pump handle is forced clear down. This allows the jack to be lowered in the usual way by the pump handle without turning the valve handle. The valve chamber, being on one side of the cylinder, is always submerged, and the jack can be used in a horizontal position with a full run-out equally as well as in a vertical position. The valves are easily removed by taking out the ram and unscrewing the bonnet under the pressure valve. If for any reason one or more of the valves should stick or obstructions lodge on the seats, they can be forced off by the valve handle and the pump operated by a few quick strokes. The liquid churning through the valves would then remove any obstruction or dirt on the seat.

Two special types of jacks made with this construction are also shown in the illustrations. One is a 500-ton ram and force-pump combined which was made for lowering to its seat a 500-ft. truss bridge which was floated into position. The other is a new type for straightening shafts or for use where a downward movement of the ram is required. The pump is mounted in the barrel between the ram and the reservoir and the ram is returned by a rack and pinion arrangement at the lower end of the casing. The reservoir



500-Ton Hydraulic Ram and Dudgeon Universal Force Pump Combined.

pressure valves and two suction valves to one pressure valve and two suction valves, of which only one is used at a time.

The accompanying sectional view of a portable hydraulic force-pump shows all of the essential features which are embodied in the new types of jacks. The arrangement of valves and pumps is very similar, but in the jack the pump and valves are built inside of the movable ram, which is raised by discharging the fluid through the bottom of the ram into the cylinder. In the jacks the valves are controlled by the valve handle on the head by means of a spring-mounted push tube on which the valve cam bears.

As will be seen from the illustration the three valves are mounted in tandem, one over the other, in a single valve case on one side of the pump cylinder. The two top valves are suction valves and are free to move on or off their seats, while the single pressure valve at the bottom is normally closed by a spring. When the valve handle is turned to the left to a horizontal position all three valves are free to seat. This is the position for using both pumps. On the up stroke of the pump the liquid is drawn from the reservoir in the head past the two upper valves and into the upper and lower cylinders through the small ports at the bottom of these cylinders. On the down stroke the upper valve is seated, cutting off the supply reservoir and the liquid displaced by the two pump plungers flows past the two lower valves into the discharge passage. When only one pump is wanted the valve handle is turned vertically downward and the cam on the inner end of the valve handle shaft forces the upper valve off of its seat. The liquid in the upper cylinder churns back and forth past the upper valve, but the middle valve is still operative and prevents the return

flange is provided with bolt holes for attaching the jack to the bottom of the beam, as shown. A large number of other special types of jacks are made on this principle. Richard Dudgeon, 24 Columbia street, New York City, is the maker.

Freight Car Situation in the Northwest.

The following notes on the railroad situation in the Northwest are published in the newspapers as the conclusions of Interstate Commerce Commissioner F. K. Lane:

(1) The railroads have added to their equipment as many cars and engines as could be expected of them during the past year, and with few exceptions their equipment facilities are adequate, or would be if eastern roads would make reasonable prompt returns.

(2) In this respect the railroads of the Northwest have done better than those of most other sections. Great Northern has in the past 18 months increased its equipment facilities, for illustration, more than any other railroad with 6,000 miles of road, with the exception of Pennsylvania.

(3) The acute car congestion last winter was due to causes other than equipment supply to a much greater extent than is generally supposed.

(4) Last winter was the worst climatically within the memory of living operating officials. No precaution against such conditions is adequate.

(5) Traffic congestion has already begun and is now acute in Montana and on the coast.

(6) Congestion throughout the Northwest may be as severe as

a year ago for short periods, but the general situation will be better for the following reasons:

(a) Presumably a normal winter, or at least a less severe winter than last.

(b) More equipment and power and other facilities, including spurs, double track in spots, sidings, etc.

(c) The benefit of extraordinary efforts a year ago to meet an extraordinary situation, shippers as well as carriers having learned new tricks.

(d) Less traffic, the grain crop being smaller and many large industries curtailing output, to say nothing of the postponement of new enterprises.

(7) High prices for grain will cause a larger early rush of grain traffic than last fall, though somewhat later in starting, the crop season being late. This will support the volume of general traffic to the country until the first of the year, the purchasing power of farmers being fully equal to that of a year ago.

(8) A sharp decline in tonnage is expected early in the new year.

(9) There is danger of another fuel famine, but not as distressing as that of last winter.

(10) Lumber traffic on the coast is congested because it has outgrown the facilities of the Hill and Harriman lines and the mills cannot create an ingoing traffic in proportion to their output.

(11) Completion of the St. Paul's Pacific extension will afford only slight and temporary relief to the growing traffic of the Western country. All transcontinental lines will have to be double-tracked before very long.

(12) As an offset to the more favorable operating prospects than those of last year there are reciprocal demurrage and other restrictive provisions imposed on the railroads which will tend to aggravate a car congestion.

(13) The situation has been complicated by the unrest and inefficiency of labor and the exorbitant and sometimes unreasonable demands it makes on the railroads.

The territory which raised the most wheat last year is prairie country where snow storms and blizzards are most embarrassing to the railroads. The most prolific sections this season are in the valleys and on timbered areas where a rough winter does the least harm.

Adams Express Company Officers.

George F. Baker, President of the First National Bank of New York, has been elected a member of the board of managers of the Adams Express Company, succeeding Caleb S. Spencer, of Boston. The Board of Trustees, provided for in a recent vote by the shareholders, has been organized as follows: L. C. Weir, B. W. Rowe, Charles Steele, Dumont Clarke and G. F. Baker. William M. Barrett has been appointed Vice-President in charge of the Pennsylvania, New England and New York departments. Edward A. Taft has been appointed General Manager of the New England department, Henry E. Huff General Manager of the Pennsylvania department, G. D. Curtis General Manager of the Western department, and Joseph Zimmerman General Manager of the New York department, including the bureau of traffic and the bureau of tariffs.

Disastrous Collision Near Bellaire, Ohio.

In a butting collision between a passenger train and a freight on the Baltimore & Ohio at Shicks, Ohio, near Bellaire Junction, on September 28, seven passengers and two trainmen were killed and 15 persons were injured. The cause of the accident is given in the newspapers as the misplacement of a switch by an operator in a signal tower.

The Railroad Department of McGill University.

The department of railroads of McGill University, Montreal, is to broaden its work this year. V. I. Smart, who has been Signal Engineer and Assistant Engineer of Maintenance of Way of the Chicago & Eastern Illinois, is to have charge of the department of railroad engineering, including the theory and practice of location and construction, maintenance and operation. Signaling, a new course of instruction, is also to be established under Mr. Smart. The railroad department is to have a laboratory of its own in its new building. Clarence Morgan, formerly Treasurer of the Rutland Railroad, is the head of the department.

"Pay-as-You-Enter" Street Cars for Chicago.

The Chicago City Railway Company is having built, and expects to receive during October and November, 300 cars which will be arranged for testing the "pay-as-you-enter" feature, which originated, and is in general use, in Montreal. Should the results with these 300 cars justify the adoption of the scheme, the remainder

of the company's standard equipment, comprising about 500 double-truck cars, will be adapted to this feature. This will require only lengthening the platforms and rearranging the doors. The entrance portion of the rear platform will accommodate 20 passengers, and it is hoped that this will be ample to avoid delay, even at busy corners. Overcrowding of cars is to be prevented by the conductor, who from his post on the rear platform will notify intending passengers to take the next car, when his is fully loaded.

TRADE CATALOGUES.

Signal Lamps and Lanterns.—Catalogue No. 120 of The Adams & Westlake Co., Chicago, presents recognized standards for signal lamps and lanterns made by this company. The large number of special styles also made, which meet the demand for patterns other than standard, are omitted from the catalogue. Beginning with an illustrated description of the "Adlake" non-sweating balanced-draft, the book covers the various kinds of lamps for steam and electric railroad use, telegraph train-order signals, lanterns, miscellaneous lamps, lamp parts and switch and signal box locks. All colored signals, lenses, etc., are printed in their appropriate colors. There is an appendix containing the signal rules of the Standard Code. The book is 6 x 9, bound in cloth, and has 200 pages.

Paint.—The National Paint Works, owned by Elliot & Cheesman, Williamsport, Pa., has published the seventh edition of "The Review of Technical Paints for Metal," by F. P. Cheesman. The pamphlet takes up various paint troubles and tells how to avoid them. It describes different kinds of paint and their advantages and disadvantages, and then discusses coating for reinforced concrete and cement and the methods of painting bridges, elevated railroad structures, power plants, steel cars, etc. Different paints made by the National Paint Works are then described in detail and instances given of the structures on which they have been used.

Ore Handling Cranes.—The Brown Hoisting Machinery Company, Cleveland, Ohio, has just issued a pamphlet on locomotive grab-bucket cranes for handling ore, coal, etc. The standard bucket supplied has a rated capacity of 24 cu. ft. of ore. The pamphlet is illustrated with scale drawings of the crane mounted on two bogie trucks and on a four-wheel rigid truck, and with half-tones of the crane in operation under various conditions showing its flexibility.

Metallic Packing.—The H. W. Johns-Manville Company, New York, is distributing a pamphlet describing Morris metallic packing, for which the company has exclusive selling rights. It is made by the Morris Metallic Packing Company, Philadelphia, Pa. The pamphlet shows different varieties of it as applied to valve stems, reciprocating rods and very large rods; also for high-pressure marine service.

Chicago, Burlington & Quincy.—The passenger department of this company is distributing picture postal cards showing beautiful views along the Mississippi river.

MANUFACTURING AND BUSINESS.

E. W. Buechling has been appointed to the new office of Assistant Manager of Sales of the Pittsburgh Automatic Vise & Tool Co., Pittsburgh, Pa.

The Consolidated Mining & Steel Company will, it is said, spend about \$700,000 putting up a large iron and steel plant near Guernsey, Wyo. F. O. Olsen, Pittsburgh, Pa., is interested.

Cars began running September 28 on the electric street railway system of St. Petersburg, installed by the Russian subsidiary company of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.

Lee Holliday has been appointed Signal Engineer and Agent of the Union Switch & Signal Co., Swissvale, Pa., and will have charge of the Southwestern district, with headquarters at St. Louis, Mo., succeeding F. G. Ashton, resigned.

J. W. Lawler, formerly Superintendent of the foundry department of the Madison Car Works, has been appointed Superintendent of the iron and foundry department of the St. Charles plant of the American Car & Foundry Company, New York.

The United States Steel Corporation has bought, probably through the American Steel & Wire Co., the National Steel & Wire Co., of New Haven, Conn., which was recently sold for \$650,000 in bankruptcy proceedings. The National Steel & Wire Co. has two large plants and is capitalized at \$5,000,000.

The McKenzie, Holland & Westinghouse Power Signal Company, Limited, has been incorporated in England by Westinghouse interests and owners of certain British signal patents. Half the stock is held by the Westinghouse Brake Company, Limited, of London.

The new company will build a plant adjoining the Westinghouse Brake Company's shops at King's Cross, London.

J. E. Ham, formerly with the Hazard Manufacturing Co., Wilkes-barre, Pa., has been appointed representative of the Waterbury Company, New York, for the introduction of its higher grades of insulated wires and cables. Mr. Ham's office will be at the Waterbury Company's branch office, 108 La Salle street, Chicago, Ill.

The Betts Machine Co., Wilmington, Del., makers of heavy machine tools, are still busy with ordered work, although there is a falling off in railroad inquiries. The following are among recent shipments: One 84-in. tire mill, with universal chuck table, to the Richmond Works of the American Locomotive Co.; one 8-ft. boring and turning mill to the Great Northern, at Devil's Lake, Minn.; one 8-ft. boring and turning mill to the Georgia Railroad at Atlanta, Ga.; one 52-in. car wheel borer, motor-driven, to the Mississippi Central at Hattiesburg, Miss.; one 15-in. slotter, motor-driven, to the Davenport Locomotive Works, Davenport, Iowa; four 15-in. slotters to the Readville, Mass., shops of the New York, New Haven & Hartford; one 6-ft. boring and turning mill to the Chicago, Milwaukee & St. Paul at Dubuque, Iowa; one motor-driven No. 2 horizontal boring machine to the Brooklyn Heights Railroad, Brooklyn, N. Y.; one 8-ft. boring mill, one No. 2 horizontal boring machine and one 84-in. planer, all motor-driven, to the Southern Railway at Knoxville, Tenn., and six motor-driven 66-in. tire mills to the Schoen Steel Wheel Co., McKees Rocks, Pa.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

American Society of Civil Engineers.

At the meeting of this society, October 2, two papers were presented, one on Reinforced Concrete Towers by D. W. Krellwitz, and one by C. W. Smith on Reinforced Concrete Pipes for Carrying Water Under Pressure. Both of these papers were printed in the August proceedings.

American Railway Association.

Announcement is made that the fall meeting of this association will be held at the Waldorf-Astoria, New York city, on Wednesday, October 30, 1907. It was originally intended to hold the fall meeting at Norfolk, Va., on Oct. 23, but on account of the important nature of the business to be considered and the fact that a larger attendance can be secured at New York than at Norfolk, the President of the association, with the unanimous approval of the Executive Committee, at the request of a large number of members, has decided to call the meeting as above noted at New York city on Oct. 30.

American Society of Mechanical Engineers.

At a meeting of this society to be held in the Engineering Societies Building, New York, October 8, the subject will be "Industrial Education." College technical courses and student apprenticeship courses will be discussed at length. A paper by Prof. John Price Johnson on the "College Technical Courses and Apprenticeship Courses" offered by manufacturing establishments will be read. An address will also be delivered by Dr. Henry S. Pritchett, President of the Carnegie Foundation, and one by Prof. Dugald C. Jackson, of the Massachusetts Institute of Technology, and President of the Society for the Promotion of Engineering Education.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Boston & Albany.—A. H. Smith, Vice-President and General Manager of the New York Central & Hudson River, has been elected also Vice-President and General Manager of the Boston & Albany. Edgar Van Etten, Vice-President of the New York Central & Hudson River and of the Boston & Albany, heretofore in charge of the Boston & Albany, remains at Boston as Vice-President but no longer has charge of the operating department. He will perform such duties as may be assigned to him by the President and Senior Vice-President of the New York Central & Hudson River. J. H. Hustis, General Superintendent of the Western district of the New York Central & Hudson River, has been appointed Assistant General Manager, with headquarters at Boston. See Boston & Albany under Engineering and Rolling Stock Officers.

Chicago & Alton.—Edwin Hawley has been elected Vice-President; T. H. Hubbard, Vice-President of the Toledo, St. Louis & Western, has been elected Chairman of the Board of the Chicago & Alton. T. P. Shonts, President of the T., St. L. & W., has been

elected Chairman of the Executive Committee of the C. & A.; J. S. Mackie, Secretary of the Colorado & Southern, has been elected Secretary and Assistant Treasurer of the C. & A., and F. H. Davis, Treasurer of the Minneapolis & St. Louis, has been elected Treasurer of the C. & A.

Colorado Southern, New Orleans & Pacific.—See Eunice, Lafayette & Abbeville.

Delaware & Hudson.—W. H. Williams, Assistant to the President, has been elected Third Vice-President.

Eunice, Lafayette & Abbeville.—George A. Clark, formerly Vice-President and General Manager of the Colorado Southern, New Orleans & Pacific, has been elected Vice-President and General Manager of the Eunice, Lafayette & Abbeville, which is about to be built.

Houston & Brazos Valley.—C. H. Brightwell has been appointed Auditor, with office at Velasco, Tex., succeeding P. F. Combs, resigned.

New York Central & Hudson River.—See Boston & Albany.

Orange & Northwestern.—J. J. McEwen, Jr., has been appointed Auditor, succeeding T. C. McCampbell, resigned. J. O. Sims, Jr., has been appointed Treasurer, succeeding W. W. Reid, resigned.

St. Louis, Rocky Mountain & Pacific.—A. W. Newman has been appointed Assistant Secretary.

Toledo Railway & Terminal.—Leslie Reddish, assistant chief clerk to the General Manager, has been appointed Car Accountant, succeeding Albert Beck, resigned to go into other business.

Tonopah & Tidewater.—The general offices have been moved from Oakland, Cal., to Los Angeles.

Operating Officers.

Alabama Great Southern.—See Cincinnati, New Orleans & Texas Pacific.

Boston & Albany.—See Boston & Albany under Executive, Financial & Legal Officers.

Chicago, Rock Island & Pacific.—R. C. St. John, Trainmaster of the Pine Bluff district of the Arkansas division of the St. Louis, Iron Mountain & Southern, has been appointed Trainmaster of the Memphis district of the Arkansas division of the Chicago, Rock Island & Pacific.

Cincinnati, New Orleans & Texas Pacific.—W. S. Andrews, Assistant to the General Manager, has been appointed General Superintendent of Transportation of this road and of the Alabama Great Southern, with office at Cincinnati, Ohio.

Erie.—T. J. English, Superintendent at Youngstown, Ohio, has been appointed Assistant to the General Manager. F. J. Moser, Superintendent at Huntington, Ind., succeeds Mr. English. E. C. Allen, Assistant Superintendent at Gallon, Ohio, succeeds Mr. Moser.

J. H. Klein, Trainmaster at Huntington, Ind., has been appointed Trainmaster of the Chicago division, succeeding H. D. McClelland, transferred. D. I. Jones, chief dispatcher, succeeds Mr. Klein.

Grand Trunk.—D. Crombie has been appointed Assistant to the General Transportation Manager, with office at Montreal, Que., succeeding A. A. Tisdale, resigned to go to another company. M. S. Blaiklock, Superintendent of the Eastern division, has been appointed Engineer of Maintenance of Way, with office at Montreal. H. E. Whittenberger, Superintendent of the Kansas City Southern at Pittsburgh, Kan., succeeds Mr. Blaiklock, with office at Montreal.

Kansas City Southern.—See Grand Trunk.

New York Central & Hudson River.—The office of J. P. Bradfield, Assistant General Manager, has been transferred from New York to Buffalo. L. H. Van Allen, Superintendent of the Buffalo division, has been appointed General Superintendent of the Western district, succeeding J. H. Hustis, promoted. S. R. Payne, Superintendent at Rochester, N. Y., succeeds Mr. Van Allen. T. W. Evans, Assistant Superintendent at Jersey Shore, Pa., succeeds Mr. Payne. See Boston & Albany under Executive, Financial and Legal Officers.

St. Louis, Iron Mountain & Southern.—See Chicago, Rock Island & Pacific.

Southern.—W. M. Deuel, Superintendent at Rock Hill, S. C., has been appointed Superintendent of Terminals at Atlanta, Ga. E. M. Newell, Superintendent of the Mooresville division, succeeds Mr. Deuel, and the Mooresville division is merged with the Winston-Salem division. F. P. Pelter, Superintendent of the Chattanooga division, has been appointed Superintendent of the Nashville division, and the Chattanooga division is merged with the Atlanta and Knoxville divisions.

Traffic Officers.

Chicago, Burlington & Quincy.—A. C. Maxwell, chief clerk to the General Freight Agent of the Lines West of Missouri River, has been appointed General Agent at Keokuk, Iowa, succeeding J. H. Jarnett, who takes Mr. Maxwell's former position.

Grand Trunk.—See Grand Trunk Pacific.

Grand Trunk Pacific.—John W. Loud, Freight Traffic Manager of the Grand Trunk, has been appointed also Freight Traffic Manager of the Grand Trunk Pacific.

Mexican Central.—The office of Passenger Traffic Manager formerly held by W. D. Murdock, who resigned because of ill health, has been abolished and the duties of that office will hereafter be performed by the General Passenger Agent.

Tonopah & Tidewater.—George I. Hughes has been appointed General Eastern Agent at New York. F. M. Jenifer has been appointed General Agent at Goldfield, Nev.

Engineering and Rolling Stock Officers.

Ann Arbor.—See Detroit, Toledo & Ironton.

Baltimore & Ohio.—L. E. Halslip, Assistant Division Engineer of the Pittsburgh division, has been appointed Assistant Engineer of the Wheeling division, succeeding J. J. Smiley, resigned. T. H. Brown succeeds Mr. Halslip.

Bangor & Aroostook.—O. Stewart, Superintendent of Motive Power and Equipment, has retired after 60 years of railroad service. H. Montgomery, Assistant Superintendent of Motive Power and Equipment, succeeds Mr. Stewart, with office at Milo Junction, Me., and his former position has been abolished.

Boston & Albany.—R. D. Smith, Mechanical Expert of the Lake Shore & Michigan Southern, has been appointed Assistant Superintendent of Motive Power of the Boston & Albany, with office at Albany, N. Y., in charge of Boston & Albany matters and such other duties as may be assigned to him.

Chicago, Rock Island & Pacific.—E. E. Chrysler, general foreman at Chickasha, Ind. T., has been appointed Master Mechanic at that place.

Detroit, Toledo & Ironton.—W. G. Wallace, Superintendent of Motive Power of this road and of the Ann Arbor, has resigned.

Erie.—E. I. Dodd, Mechanical Engineer of the Pullman Company, has been appointed Assistant Mechanical Superintendent of the Erie, with office at Meadville, Pa.

Florida East Coast.—O. M. Carter, formerly Captain in the engineer corps of the United States Army, has been appointed Consulting Engineer of the Florida East Coast in connection with the extension across the Florida keys.

Grand Trunk.—See this company under Operating Officers.

Hocking Valley.—W. L. Mattoon, Division Engineer of the Zanesville & Western and of the Corning division of the Toledo & Ohio Central, has been appointed Principal Assistant Engineer of the Hocking Valley and the Zanesville & Western, with office at Columbus, Ohio, succeeding Parker S. Cott, resigned to go to the Sunday Creek Coal Company at Athens, Ohio. D. C. Holtzbery, Division Engineer of the Eastern division of the Toledo & Ohio Central, succeeds Mr. Mattoon, with office at Columbus, Ohio. P. R. Black succeeds Mr. Holtzbery, with office at Bucyrus, Ohio.

Lake Shore & Michigan Southern.—See Boston & Albany.

Seaboard Air Line.—J. J. Hanline has been appointed Master Mechanic at Atlanta, Ga., succeeding A. J. Poole, promoted.

Toledo & Ohio Central.—See Hocking Valley.

Zanesville & Western.—See Hocking Valley.

Purchasing Agents.

Michigan Central.—See New York Central & Hudson River.

New York Central & Hudson River.—S. B. Wight, Purchasing Agent of the Michigan Central, has been appointed Purchasing Agent of the New York Central & Hudson River, succeeding Dexter Fairchild, resigned.

LOCOMOTIVE BUILDING.

The Texas Railroad Commission has notified the railroads of that state that they must get additional locomotives.

The Fo-Kien Railway, China, has ordered two six-wheel tank locomotives from the American Locomotive Company.

The Mexican Sugar Refining Company, El Potrero, Vera Cruz, is said to have ordered three locomotives from the H. K. Porter Company.

The Harriman Lines, as reported in the *Railroad Gazette* of September 20, have ordered 30 mogul locomotives, 10 Atlantic locomotives, 43 consolidation locomotives, 24 ten-wheel locomotives and 18 six-wheel switching locomotives from the American Locomotive Company.

CAR BUILDING.

The National of Mexico, it is said, is contemplating buying some all-steel postal cars.

The Mexican Central, it is said, is thinking of buying some all-steel passenger coaches.

The Philadelphia Rapid Transit, it is said, will order 200 Montreal type street cars within a few weeks.

The Texas Railroad Commission has notified the railroads of that state that they must increase their rolling stock.

The Chicago, Rock Island & Pacific has ordered one compound steam motor car from the American Locomotive Company.

The Southern denies having ordered 500 freight cars from the American Car & Foundry Company, as reported in the *Railroad Gazette* of September 27.

The Las Vegas & Tonopah has ordered four cabooses from the Pullman Co., for February, 1908, delivery. These cabooses are in accordance with the San Pedro, Los Angeles & Salt Lake standard.

The New Orleans Great Northern has ordered from the Western Steel Car & Foundry Co. 200 steel underframe composite gondola cars of 80,000 lbs. capacity, 200 steel underframe flat cars of 80,000 lbs. capacity, 300 all-wood box cars of 60,000 lbs. capacity and 65 all-wood stock cars of 60,000 lbs. capacity.

RAILROAD STRUCTURES.

BRANDON, MAN.—The Canadian Pacific and the city officials have agreed to jointly build a bridge at First street. The question is yet to be decided whether it will be a steel or reinforced concrete structure.

CHEYENNE, WYO.—Local reports say that the Union Pacific will put up a new roundhouse to cost \$40,000 and a coal chute to cost \$50,000.

GREENCASTLE, PA.—The Cumberland Valley, it is said, will put up a passenger station here.

MOBRIDGE, S. DAK.—The Chicago, Milwaukee & St. Paul has about finished the pier work on the bridge here. The force is to be transferred to Chamberlain, where a steel bridge is to be built.

NACO, MEX.—Colonel Epes Randolph, of the Southern Pacific, is quoted as saying that the shops of the Cananea, Yaqui River & Pacific at this place will be finished and equipped as originally planned, and that the report that these improvements are to be abandoned is without foundation.

NEW ORLEANS, LA.—The Texas & Pacific, it is said, is planning to spend a large amount of money improving its terminals and putting up a new passenger station here.

NEW YORK, N. Y.—The Interborough Rapid Transit Company, it is said, has filed plans for enlarging the car inspection station and storage house at Seventh avenue and 148th street. A brick addition 60.3 ft. x 96 ft. with a steel frame and steel roller doors is to be added.

NORTH BATTLEFORD, SASK.—A contract is reported let to Newman & Co., of Regina, at \$100,000 for the superstructure of the bridge to be built over the Saskatchewan river here.

SAN ANGELO, TEX.—The Orient Construction Company is to build a steel bridge 150 ft. long over Jackson creek.

TOLEDO, OHIO.—The new two-story steel and brick in-bound freight house, 50 ft. x 600 ft., being built for the Lake Shore & Michigan Southern, was to be opened for business October 1st, and the out-bound freight house is expected to be finished about the first of next year.

RAILROAD CONSTRUCTION.**New Incorporations, Surveys, Etc.**

ALABAMA WESTERN.—See Illinois Central.

ARKANSAS, LOUISIANA & GULF.—An officer writes that contracts have been let to the Southern Development Co. and work is under way on this proposed line from Monroe, La., northeast to Bastrop, thence north via Rolfe Junction, Ark., to Hamburg, 57 miles, with a branch from Rolfe Junction west to Crossett, five miles. The work is easy; no cuts will exceed 20 ft. in depth and no fills will be more than 25 ft. high. The maximum grade is $\frac{1}{2}$ per cent. compensated for curvature, and maximum curvature is 3 deg. The work

includes a steel bridge and an aggregate of about one mile of pile bent trestles at various points, ranging in length from 28 ft. to 600 ft. About 20 miles of grade work is finished and several of the pile trestles are in place. Track laying to begin October 1. William A. Otis, President; J. M. Parker, General Manager, and E. T. Bond, Chief Engineer, Monroe, La.

ATCHISON, TOPEKA & SANTA FE.—Final surveys are reported made for building a line to Burro mountain, N. Mex. The line is to be built from near Silver City and will branch into two divisions at the Mangus divide near Oak Grove Hill, one branch going to Tyrone and the other following the divide via the Comanche, Klon-dike and Copper Gulf camps to Leopold.

BLOOMINGTON SOUTHERN.—See Illinois Central.

CANADIAN NORTHERN.—President William Mackenzie is quoted as saying that this company will build a line this year from Saskatoon, Sask., southwest 30 miles; also that the final plans for the joint terminals to be built at Winnipeg by this company and the Grand Trunk Pacific at an estimated cost of \$3,000,000 have been approved.

CANANEA, YAQUI RIVER & PACIFIC.—See Southern Pacific.

CHICAGO & MILWAUKEE (ELECTRIC).—Announcement is made that this road will be opened for through traffic to Milwaukee by the middle of November.

CHICAGO SOUTHERN.—Track laying is reported finished on this road, which is to run from Chicago Heights, Ill., where connection is to be made with the Chicago Terminal Transfer, south 114 miles to the Indiana state line, at which point connection is to be made with the Southern Indiana, which runs to Terre Haute. (July 12, p. 53.)

COLORADO ROADS.—A company has recently been formed in Denver to build a tunnel about five miles long through James Park. It is said that when the work is finished the tunnel is to be leased to the Denver, Northwestern & Pacific. The incorporators include T. F. Walsh and C. B. Kountze, of the Colorado National Bank; D. Sullivan, of the Denver National Bank; D. H. Moffat, W. G. Evans, J. W. Springer and others.

CUMBERLAND VALLEY.—A two-mile connecting line being built jointly by this company and the Philadelphia & Reading at Shippensburg, Pa., is nearing completion. Grading has been finished. This line will be used for exchange of freight.

The belt freight line of this company around Greencastle, Pa., will shortly be put in service.

DENVER, NORTHWESTERN & PACIFIC.—See Colorado Roads.

DILLSBURG & WELLSVILLE.—Incorporated in Pennsylvania with a capital of \$75,000 to build a line from a connection with the Dillsburg & Mechanicsburg branch of the Cumberland Valley at Dillsburg, Pa., southeast to Wellsville, 7½ miles. It has not been decided whether the line shall be operated by steam or electricity. The directors are: A. C. Hetrick, President, Wellsville; R. J. Belt, J. Milligan, W. D. Brougher, I. J. Seiple, J. N. Logan, E. W. Shapley, D. W. Beitzel and S. G. Bushey.

DUE WEST RAILWAY.—An officer writes that this company, which is building a line from Donalds, S. C., on the Southern, south to Due West, 4½ miles, has grading finished and the ties laid. (June 7, p. 819.)

GAULEY & BIRCH RIVER.—Incorporated in West Virginia with \$300,000 capital to build a line from the mouth of Muddlety Creek in Nicholas county, north via Hookersville to a point near the mouth of Big Birch river in Braxton county, 25 miles. The names of the incorporators are not given. The office of the company is to be at Summerville.

GREAT NORTHERN.—President L. W. Hill, of this company, is quoted as saying that a good deal of old extension work is nearing completion, the most important being the cut-off between Great Falls, Mont., and a connection with the Chicago, Burlington & Quincy at Billings. Grading on this line is to be finished this year and it is expected to be in operation early next year.

GRAND TRUNK PACIFIC.—The Grand Trunk Pacific Construction Company, which has the contract for building 150 miles of this line east of Abitibi river, Que., has sublet some of the work to the J. H. Reynolds Construction Company. Work is to be started on this section early in the spring.

Treat & Johnson, of Winnipeg, who have the contract for building 51 miles of line for this company between Winnipeg, Man., and Portage La Prairie, will sublet some of the work. (June 28, p. 949.)

GULF, COLORADO & SANTA FE.—Surveys are reported being made by this company for a line from Timpson, Tex., east to Center, 18 miles.

ILLINOIS CENTRAL.—The report of this company for the year ended June 30, 1907, shows that work has been continued on the

Memphis & State line, which is to be a double-track railroad from Woodstock, Tenn., to East Junction, about 15.84 miles, to relieve the congestion of traffic in Memphis by sending freight trains around that city.

The line to Birmingham, Ala., will be ready for use Nov. 1. Trackage rights will be used over the Mobile & Ohio from a point near Jackson, Tenn., to Corinth, Miss., 55 miles; and over the Northern Alabama from Haleyville, Ala., to Jasper, 40 miles; over the Kansas City, Memphis & Birmingham, 41 miles from Jasper, to Birmingham. The connecting links built were from a point south of Jackson, east to a connection with the Mobile & Ohio, three miles, and from Corinth, Miss., southeast to Haleyville, Ala., 80.23 miles. The line in Mississippi is being built under the name of the Mississippi & Alabama, 42.41 miles, and that in Alabama under the name of the Alabama Western, 37.82 miles.

The Bloomington Southern has built a line from the connection of the Indianapolis Southern near Bloomington, Ind., to stone quarries, 2.13 miles. This was put in operation in June.

Under the name of the Memphis Railroad & Terminal Company, a company was organized in Tennessee to build a union passenger station in the city of Memphis. The estimated cost of this work is about \$3,000,000, and is to be divided between the ten lines entering Memphis.

INDIANAPOLIS & NORTHWESTERN TRACTION.—General Manager C. C. Reynolds is reported to have said that this line is to be extended from Crawfordsville, Ind., west to Danville, Ill., 45 miles, to a connection with the McKinley syndicate lines.

INTERBOROUGH RAPID TRANSIT.—The New York City Board of Estimate and Apportionment has appropriated \$850,000 to lay additional subway tracks north from 96th street and Broadway. The plans call for one new track on the east side from 96th street to 102d street, and two on the west side from 96th street to 101st street. The improvements are being made to obviate the necessity for the express trains to cross the local tracks.

LORAIN & ASHLAND.—This company, which last year built a line from Lorain, Ohio, south to Wellington, 22 miles, has rights of way for an extension from Wellington south to Loudonville, on the Pennsylvania Lines West, 39 miles. Recent reports say that the line is to be extended south to the Ohio river probably at Gallipolis, 90 miles south of Wellington, and from this point a line is eventually to be built either by this company or by the Virginian Railway southeast to the northern terminus of that line at Deepwater, W. Va., about 75 miles. There would then be a through line from the lakes to the Atlantic seacoast at Norfolk, Va. (July 5, p. 27.)

MEMPHIS & STATE LINE.—See Illinois Central.

MEMPHIS RAILROAD & TERMINAL.—See Illinois Central.

MEXICAN ROADS.—Arrangements are reported made for building a line from Balsas, Guerrero, on the Mexican Central, west to the Port of Zihuatanejos on the Pacific coast, about 125 miles. Henry I. Willey, a mining engineer of Mexico City, is promoting the project. It is said that the Rothschild interests have bought a large tract of land adjacent to the port of Zihuatanejos and are back of this project.

MISSISSIPPI & ALABAMA.—See Illinois Central.

MISSOURI SOUTHERN.—This company has under consideration the question of building a branch from Boyd, Mo., or Tip Top southwest to Van Buren, 10 miles, and eventually further south and west of that place.

MOUNT VERNON & EASTERN.—Incorporated in New York with \$1,000,000 capital to build a line from Mount Vernon, N. Y., northeast to Lewisboro, near the Connecticut state line, about 35 miles. The directors include: Oakleigh Thorne, C. Bruce, H. K. Woods and others interested in the New York, Westchester & Boston.

NEW YORK SUBWAYS.—Bids were recently opened by Bridge Commissioner Stevenson for supplying and installing the electrical equipment of the tracks to extend from the Manhattan terminal over the Williamsburg bridge. The bids were: F. E. Gore, of Gore & Hoey, \$343,000; Daniel Moran and the Snare & Trieste Company, joint \$396,000. The work is to be finished by January 1.

NEW YORK, WESTCHESTER & BOSTON.—See Mount Vernon & Eastern.

NEW ORLEANS GREAT NORTHERN.—This company, it is said, is now operating the extension of its main line north of Angie, La., to Columbia Junction, Miss., 20 miles.

NORTHERN OF MAINE.—This company has been incorporated with a capital of \$500,000 to build a line from the terminus of the Bangor & Aroostook at Fort Kent west to a point opposite the mouth of the St. Francis river; also to build from Fort Kent northeast through Frenchville, Madawaska and Grand Isle to Van Buren, 45 miles, connecting at that point with the Bangor & Aroostook. (March 15, p. 388.)

NORTHWESTERN PACIFIC.—See Southern Pacific.

OKLAHOMA CITY RAILWAY (ELECTRIC).—Incorporated in Oklahoma to build electric line from Guthrie, Okla., south to Norman and Yukon; also a line from Spencer or Choctaw City west via Oklahoma City to Yukon, a total of about 150 miles. Directors include: A. H. Classen, H. M. Brauer, E. H. Cooke and J. M. Owen, all of Oklahoma City. The company already has a line in operation from Oklahoma City to Britton, which is being extended to Guthrie.

OREGON RAILROAD & NAVIGATION.—See Oregon Short Line.

OREGON SHORT LINE.—Work is reported under way on a line from Huntington, Ore., at the junction of the Oregon Railroad & Navigation Co.'s line, north along the Oregon-Idaho state line following the Snake river to Lewiston, Idaho, on the Washington state line. At this point connection is to be made with the Oregon, Washington & Idaho, which is building a line west to Texas Ferry, Wash., opposite Riparia, on the O. R. R. & N. Such a line would give the Union Pacific an almost level grade all the way, with two or three exceptions, from Granger, Wyo., to Portland, Ore. The present line of the O. R. R. & N. from Huntington west to the Columbia river grades.

PENNSYLVANIA.—The work which this company has been carrying out on the Pittsburgh division for the new main line between Southwest Junction, Pa., a mile east of Greensburg, east to Beatty, about seven miles, has been finished. The new line, which is known as the Donohue cut-off, has four tracks in place of the two tracks on the old line. From George to Beatty, about five miles, the line is almost straight. On this section a 1,200-ft. tunnel was eliminated, six 4-deg. curves being replaced by two 1-deg. curves, grades reduced and several grade crossings are now carried overhead.

Along the Susquehanna river, from Benton Station, Pa., to Safe Harbor, more than 13 miles, the Columbia & Port Deposit tracks have been elevated at a cost of \$1,250,000. This work was done to escape floods when the dam across the river at McCall's Ferry is finished, which will raise the level of the water 60 ft. At the site of the dam the new tracks are 25 ft. above the old road-bed, but the maximum grade northbound is only three-tenths of 1 per cent., with a temporary run down grade of one-half of 1 per cent. at Benton.

PEOPLES' RAILWAY & CONSTRUCTION COMPANY.—It is reported that Megargle & Co., of New York, will build part of the proposed line from Tyler, Tex., northwest to Canton, about 40 miles, the work to be finished within 18 months. (Sept. 20, p. 340.)

PHILADELPHIA & READING.—An officer writes that a temporary freight yard is being put in at 19th and Indiana streets, Philadelphia, preliminary to the main work of track elevation.

See Cumberland Valley.

RICHMOND & TOTTEVILLE (ELECTRIC).—A company is being formed under this name in New York to build an electric line to connect Richmond, S. I., with Rossville, Kreischersville and Tottenville, about 10 miles. The proposed line is to be laid with 90-lb. rails and will cost about \$400,000. T. B. McGovern, 25 Broad street, and C. G. Kolff, 50 Broadway, New York, are said to be interested.

RIO GRANDE, SIERRA MADRE & PACIFIC.—President H. R. Nickerson, of this company, is quoted as saying that extension work on this road will be started as soon as the rainy season is over. The plans call for a line from Nueva Casas Grandes, Chihuahua, southwest via Santa Elena and Ocampo, to a point on the Pacific coast either at Guaymas or at Topolobampo, 300 miles. (July 19, p. 82.)

SHELBY COUNTY (ELECTRIC).—This company, it is said, is building an electric line from Shelby, Mo., to Salt river, five miles, to which point grading has been finished and track laying is soon to begin. The line is eventually to be extended north via Shelbyville to Bethel, 18 miles. J. D. Dale, of Shelbyville, and other residents of that place are interested in the project.

SOUTHERN PACIFIC.—Contracts are reported recently let for building a section of the Northwestern Pacific projected from Willits, Cal., north to Eureka, 290 miles. The line, which is being built jointly by the Atchison, Topeka & Santa Fe and the Southern Pacific, is finished from Eureka south to Pepper, 50 miles. (March 15, p. 392.)

It is said that the Cananea, Yaqui River & Pacific is making surveys for a branch from Cananea, Sonora, northwest to Nogales, on the Sonora division, about 80 miles.

SOUTHWESTERN INTERURBAN OF MANGUM.—Incorporated in Oklahoma with \$1,000,000 capital to build lines from Mangum via Francis to Hollis, 37 miles; from Mangum to Granite and Coldell, 40 miles, with a branch from Granite to Hobart, 15 miles, and from Mangum to Altus, 27 miles. The incorporators include: W. T. Funderburk, E. E. Pinkerton, D. J. Doyle, H. M. Ferguson, T. P. Clay and R. C. Echols, all of Mangum.

UNION PACIFIC.—Double-track work now under way on this road, and which it is expected will be finished about the first of the year,

will give this company a double-track line from Omaha west to Watson's ranch, three miles west of Kearney and 196 miles from Omaha. (June 7, p. 819.)

See Oregon Short Line.

VIRGINIAN RAILWAY.—See Lorain & Ashland.

WINNEBAGO TRACTION COMPANY.—This company, operating 40 miles of electric lines in Wisconsin from Oshkosh north to Neenah and from Oshkosh west to Omro, which was recently placed in the hands of a receiver, is to be reorganized, and improvements to cost about \$300,000 will be carried out. Of this, \$200,000 is to be used in building an extension from Omro southwest to Berlin, 12 miles.

WACO, HAMILTON & BROWNWOOD.—Surveys are being made by this company for its proposed line from Waco, Tex., west to Brownwood, about 120 miles. (July 19, p. 84.)

RAILROAD CORPORATION NEWS.

BOSTON & MAINE.—At the annual meeting on October 9 the stockholders are to be asked to approve an issue of \$6,000,000 bonds to take up floating debt. It is understood that part of the new issue will be used to refund the \$4,000,000 6 per cent. one-year notes recently sold.

CHICAGO & ALTON.—See Toledo, St. Louis & Western.

ERIE.—Gross earnings for the year ended June 30, 1907, were \$53,914,827, an increase of \$3,912,193; net earnings, \$15,747,788, an increase of \$1,617,991. The largest proportionate increase in earnings was from coal traffic. The increase in the cost of maintenance of equipment was rather less, proportionately, than in maintenance of way and conducting transportation. Taxes increased about 40 per cent., mostly on property in New Jersey.

The New York Public Service Commission, Second district, has been holding hearings on the application of the Erie to issue dividend warrants. The issue is being opposed on the ground that it would amount to the railroad's borrowing money from the stockholders without their consent. (Aug. 30, p. 248.)

METROPOLITAN STREET RAILWAY.—Adrian H. Joline and Douglas Robinson, Receivers of the New York City Railway, have been appointed also Receivers of the Metropolitan Street Railway. Minority stockholders of the last named company have formed a protective committee.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—The directors have decided to immediately offer \$1,400,000 preferred stock and \$2,800,000 common stock at par to present stockholders. One share of new preferred stock and two shares of new common stock are to be issued for every 15 shares of either class of old stock already held. (Sept. 20, p. 340.)

NATIONAL OF MEXICO.—Speyer & Company, New York, are offering, at a price to yield 7½ per cent., the unsold balance of the \$10,000,000, 1½-year, 5 per cent. notes maturing April 1, 1909. About \$7,000,000 of the notes have already been sold. These notes took the place of the notes originally maturing on October 1, 1907, which were extended for a year and a half. (September 13, page 308.)

NEW YORK CITY RAILWAY.—H. H. Vreeland, President of this company, has been appointed General Manager for the Receivers.

NEW YORK, NEW HAVEN & HARTFORD.—The annual report for the year ended June 30, 1907, shows gross earnings of \$55,601,936 against \$52,984,322 in 1906. Operating expenses were \$37,850,081, as compared with \$35,222,586 for the previous year, and net earnings were \$17,751,854 against \$17,761,735. Net earnings of the company's street railroads this year were \$3,615,899; from steamship lines \$635,127, and income from other sources \$2,077,874, making the total income for this year \$24,080,755. Deductions from income this year were \$15,187,714, as compared with \$9,752,115 last year, and net income this year applicable to dividends \$8,893,041, as compared with \$10,185,377 last year.

TOLEDO RAILWAY & TERMINAL.—A verdict for \$1,865,021 against this company has been given to the Commonwealth Trust Company, St. Louis, Mo. This sum is the difference between the principal and interest due on the bonds held by the trust company and the \$2,000,000 realized from the foreclosure sale.

TOLEDO, ST. LOUIS & WESTERN.—The directors have ratified the arrangement by which the company gets control of the Chicago & Alton.

CANADIAN PACIFIC.—The stockholders have authorized the issue of \$8,000,000 additional 4 per cent. debenture stock, of which \$101,519,411 is now outstanding. The new stock is to pay for new steamships and several recent extensions and additions. The stockholders are later to be asked to authorize the issue of the remaining capital stock, about \$28,000,000 common and \$32,000,000 preferred.